THE

ELECTRICAL REVIEW.

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THE PROSPECTS OF AN OVER-PRODUCTION OF RUBBER.

THE July number of the *India-Rubber World* has a leading article on the above subject, and as a large number of the readers of the ELECTRICAL REVIEW must be interested in this question, some as manufacturers and others as users of rubber goods, and again others as shareholders in rubber plantation companies, we propose to briefly indicate the views expressed by our contemporary, which, we believe, are the views held by well-informed people in the United States.

The writer of the article referred to divides his subject under two headings, supply and demand; and dealing with the first, he points out that it would be unreasonable to suppose that the production of rubber will not be greatly increased during the next few years, as there has been a steady, though not large, increase each year in the production of the Amazon district, and greater care is now taken to conserve the trees and collect the rubber under better conditions. There are regions where the production of forest rubber is on the decline, but there are large areas of rubber forest yet unworked in the Amazon district, and many as yet untouched sources of wild rubber in Africa, and it is anticipated that the opening up of these will more than compensate for any decline in production elsewhere, so that, on the whole, it is likely that the world will see a larger annual production of forest rubber before any falling off occurs.

With regard to cultivated rubber, it is said :—"If all the plantations formed to date should become as productive as the best now matured, so much rubber might become available as to reduce prices below a profitable level"; and again, "It must be admitted that for all the capital stated to have been invested in the planting interest since the beginning of the year to yield profits would involve an enormous over-production of rubber. But this we do not look for." The reasons given for not anticipating this excessive production are that the more successful of the old companies have been exceptionally well located, managed with skill and sound judgment, and conservatively capitalised; and that it is probable that many of the more recent companies will not be so favourably conditioned, and, therefore, they will not be able to yield satisfactory results when the price of rubber falls, as it must if production increases too rapidly for the demand, so that some plantations that have started may be abandoned, and not a few projected ones will never be started.

With regard to the growth of demand, attention is drawn to the fact that the market for rubber goods has grown constantly at a rate which has forced a larger production, and has presented the unusual situation of a raw product going up in price whilst being produced all the while on a larger scale. It cannot be expected that the present high prices of

rubber will continue permanently, and the impetus given to the demand by a fall in price is considered likely to increase it at such a rate as to give little cause to fear any over-production of rubber for a long time to come.

When dealing with this subject on previous occasions, we have expressed the opinion that it will take some years for the production of rubber to so far overtake the demand as to bring about anything like over-production, so that we are in general agreement with the conclusions of our contemporary; but our opinions were based on the anticipation that there would be hardly any appreciable increase in the output of wild rubber, as we considered that with lower prices it would no longer pay to collect many of the inferior qualities, or to collect from those regions which were so far from the ports of shipment as to make the cost of transport to the port a very heavy item. It is undoubtedly a very difficult matter to make any estimate of what the production of plantation rubber will be three or four years hence, but if it increases so rapidly as to lower the price to a figure comparable with the prices of 20 years ago, we believe that the demand will grow in proportion owing to the development of existing uses, and the introduction of new uses, for rubber which will follow the fall of prices of the raw material.

Electro-Vaccination.

The fact that a variety of skin diseases, such as psoriasis, lupus, and eczema, show material improvement under exceedingly small doses of X-ray radiation has led to the view, put forward recently by Dr. W. Deane Butcher, and reported in *Archives of the Röntgen Ray*, that the action of the irradiation is of the same nature as that of vaccination; that is, that it furnishes a stimulus under the influence of which the patient's own organism develops the equivalent of a vaccine. For example, the irradiation of a leg for lupus has been followed by improvement in a remote part of the body, such as the face; acne of the face has been cured by X-rays and high-frequency treatment applied to the back and shoulders; and numerous cases are on record in which remarkable results have been obtained from comparatively trifling applications of the treatment. Dr. Butcher remarks that "in the whole purview of medicine there is nothing more impressive, or more certain, than the cure of a small rodent ulcer by electrical methods"; but it may be effected in many ways—Röntgen rays, radium, ultra-violet light, high-frequency effluves, or zinc ions. The common factor in all these cures is, he thinks, "a biological recoil—the resentment of the cells of the organism to the insult of the ethereal vibration," resulting in the production of antitoxins or other antibodies. "It is a true vaccination."

Metal-Filament Lamps for Signs.

Whilst it cannot be said that the electric sign business is diminishing, it is certain that it is not increasing to the extent that seemed probable a few months ago. Sign and decorative lighting is a valuable adjunct to the central station as it provides a fairly steady load for from four to six hours out of the 24 during the winter season. In spite of the fact that the sign load falls on the peak during those months when the station is giving its greatest output, sign lighting is welcomed by the station engineer and he would prefer to see electric signs more widely adopted.

The utility of the signs to the user is not denied. Every shopkeeper admits that they are of value, and the only reason why they are not used to a greater extent is that the majority of tradesmen are under the impression that they are costly as regards consumption of energy.

It was the practice of contractors, particularly in the case of outline signs, to run low voltage lamps in series-parallel for this work, under-running the lamps considerably in order that the cost of current should be as low as possible. Of course the lamps were burning at a very low efficiency, but it was held that the sign was not intended for illuminating purposes and that it was sufficient if the lamps were giving from two-thirds to three-quarters their rated candle-power.

It would seem that the time is quite ripe for a change to be made in the general practice, and that it would be preferable in every way were low voltage metal-filament lamps used for the work. Lamps of this type requiring 10 or 12 volts and giving nearly four candle-power with a consumption of five watts may be readily obtained. The brilliancy of the filament, compared with that of the under-run carbon lamp, is very great and does not fall off to any noticeable extent during its life, which may be taken as being about 2,000 hours. The lamps can either be run in series-parallel on direct-current circuits of ordinary voltage, or in connection with a transformer on alternating-current circuits, in which case there is no necessity to alter the existing wiring of the sign, if it has been wired in parallel.

The power consumed will be only one-fourth of the amount required for the same candle-power in carbon-filament lamps of ordinary efficiency, and the result of the change over from the older to the modern type of lamp would be that the sign would be brighter and more attractive, the cost of energy would be much less, and the maximum demand on the station would be reduced. Signs fitted with metal-filament lamps would rapidly become popular and their increased use would more than compensate the central station for the decrease in specific consumption.

Coasting Clocks.

The cheap time-meter system of teaching drivers to save electrical energy is well known in England, and it is preferred by some to the ampere-hour or watt-hour meter systems, even since those instruments have been made stronger and more reliable than they were quite recently.

But the Americans have begun to use the time-meter, not for recording the time during which the car is under power, as we always do, but the time during which it is coasting freely. The clock works only when current is off, and until the brakes are put on. This modification of the original arrangement has certain advantages, which may commend themselves to our tramway officials, but the new device necessarily must be somewhat more complicated than the old one.

The story of the extensive trials of the coaster clock, which were carried out on the Manhattan Elevated (Second Avenue line), is told in brief in the *Railway and Engineering Review* (U.S.A.), and the results were so favourable that our advocacy of the time-meter is well justified.

After the first preliminary tests, all the trains on the Second Avenue line were equipped with the coasting clocks. The results obtained showed a material improvement in coasting and a reduction in the power required for car operation—namely, an increase in the time of coasting from 10 per cent., as it was prior to the installation of the clocks, to 38 per cent. following such installation, making a saving of 25 per cent. in the total power required for traction.

The same article mentions that the Philadelphia Rapid Transit Co. adopted the plan of installing, along its subway and elevated lines, coasting signs to show the drivers where to shut off power, which resulted in reducing the power consumption by about two-thirds, and saving brake maintenance by nearly the same amount. That scheme has been used to some extent in England, and it has never failed to induce an economy.

It has been patent for some years to all keen observers that a very handsome saving lies waiting for any tramway undertaking which has the pluck to spend a very few pounds per car upon installing meters of some kind, and the need becomes more apparent yearly, as the returns show units per car-mile creeping up from all sorts of causes. Twenty-five per cent. energy-saving to-day is worth 25 per cent. more than it was five years ago. Some managers began by keeping the meters hidden and locked away from the drivers, like some skeleton in a cupboard; but the general opinion to-day is that the fair and the best-paying way is to make each motorman an interested partaker in the preliminary experiments and a modest sharer in the monetary value of his economies in the future.

COAL-CUTTING MACHINERY AND ELECTRICAL ACCIDENTS IN MINES.

(*Continued from page* 244.)

In the Annual Report for 1908, Mr. W. H. Pickering, H.M. Inspector for No. 5 District, wrote :—"Electrical installations are becoming very common in fiery mines, and the current is often carried a long way inbye. It is impossible to foresee what will be the ultimate result of this, but it may safely be laid down as an axiom that electricity has introduced a new potential danger into the mines." In the present report Mr. Pickering continues :—"This expressed no idle fear, for on January 19th, at 12.20 p.m., an alarming explosion of fire-damp occurred at Ackton Hall Colliery, resulting in the death of two miners. The gas was ignited by an electric spark from the switch box of a motor driving a small ventilating fan."

In view of the fact that small booster or simple ventilating fans are likely to be extensively adopted, it is very important that particular attention should be given to every single detail in connection with the driving motors, and wherever these are at present installed the person responsible, or the manager of the colliery, would do well to see that an accident of this kind is practically—as far as the apparatus will allow—impossible. In this case the accident should not have happened if ordinary attention and some common sense had been used in the selection and installation of the apparatus.

The fan was used to ventilate a single heading which was driven to prove the position of a large fault. From a mining point of view the single heading was bad, and had a pair of headings been driven, the small fan would in all probability not have been necessary, and the expense attached to it avoided. The heading was 100 yards in advance of the face, and the air was forced in through 18-in. diameter pipes at the rate of 1,000 cb. ft. per minute, the fan being driven by a 4-H.P. electric motor. The motor and switch box were *supposed* to be gas tight, and to comply with Special Rule 37, which relates to the complete enclosure of the apparatus when placed in a part of the mine where safety lamps are in use. When, however, one of the deceased men went to switch off the current from the motor, there was a sharp explosion of gas, and the two men were so bably burned that they died shortly after. The cause of the accident is thus explained by Mr. Pickering :—"The motor, the switch, and resistance boxes were sources of danger, and after examining them carefully, I came to the conclusion that the explosion originated in the switch box owing to there being an *aperture between the lid and the edge of the box.* (The italics are ours.) The joint was supposed to be made gas tight by means of a strip of rubber fitted round a flange on the lid. The lid was hinged to the box, and was secured by two holding-down screw bolts. The rubber was not in the form of a ring, and to put it in position it was necessary to draw the ends together at the hinge side, nip them by lowering the lid, and then see that the rubber strip was in position in other parts, and finally screw down the lid. The rim of the box was only $\frac{5}{16}$ in. thick, and the posibilities of a failure to get the rubber strip in position in every part were obvious. *The rubber was in two pieces* when the box was opened on the 23rd inst. (three days after the accident). The box was of a very unsuitable design and calculated to prove unsafe in practical work." So far we are in complete agreement with Mr. Pickering, but we venture to differ when he goes on, "Electrical engineers are not always good mechanics, and at present few seem to have realised the danger of introducing electrical appliances into parts of mines where explosive gas may appear in dangerous quantities. It would seem, therefore, that if colliery owners and managers take the grave responsibility of installing electricity in the workings of fiery mines, they should not altogether rely upon the opinions of electrical experts, who may have crude ideas concerning mining dangers, and of the rough conditions apparatus must endure in the working face." Mr. Pickering has no right to say that electrical engineers are not always good mechanics, any more than he has to say that mining engineers are not always good "pitmen"; electrical engineers have done very much more towards grasping the conditions and dangers of electrical plant in fiery mines than the mining engineers have done. Mr. Pickering implies that the electrical contractor is to blame for making the switch box in any such way. But is the electrical contractor really to blame? Were the conditions clearly pointed out to him as to the nature of the mine in which the switch was to be used? Was there no one about the colliery who was sufficiently conversant with the electrical special rules, that they could not say to the electrical engineer "This will not do?" As a matter of fact, the last question supplies the real cause of the accident. According to law, the colliery manager is legally responsible for seeing the terms of the electrical special rules carried out, and if he is not competent to do this, then let the law be altered and some one be appointed who is. At the same time it ought to be pointed out that electrical engineers should be very careful in putting forward types of apparatus as suitable for fiery mines unless they have reliable experience to support them. In the above-mentioned case there ought to have been no rubber packing at all in the joint, but the case should have been made with a wide flange and the cover provided with a spigot to fit the interior of the box, the faces of the flanges being machined and the joint made with a sheet of brown paper. Experience has shown, however, that it is better not to have a "tight" joint, but merely a close-fitting joint, so that should any small explosion occur inside the box, the force of the explosion would find "vent" between the flanges; but the area of the surface of the latter would be sufficient to cool the flame so that it would not reach the exterior atmosphere. A box should also be strong enough to prevent fracture by an explosion, as sometimes has happened.

The remark above anent the capability of the person responsible for carrying out the special rules is even more emphasised in Mr. Gerrard's report (No. 6 District), where at Bradford Colliery a motor-man sustained a slight burn and electric shock by his fingers coming in contact with a live part, "from carelessly grasping the handle of the switching apparatus" whilst switching to reverse the motor. What kind of construction could this be which allowed the motor-man's fingers to come in contact with a live part, no matter *how carelessly* he grasped the handle? Mr. Gerrard, however, continues :—"This accident was also investigated by Mr. Nelson, who discovered in connection with two small generators, bare terminals not efficiently protected, behind a switchboard, a pail, a lamp and several brooms; the signalling wires not absolutely clear of power and lighting wires; in one motor room an isolated 'unearthed' section of tubing, carrying lighting wires. These matters were at once rectified. At the same time the following points were discussed, viz., the question of motor rooms being ventilated by fresh air carried through small pipes, the motor rooms being alongside the return airway, does General Rule 8 apply? The question of obtaining an efficient 'earth' by carrying a connection to surface 'earth plates'; the question of the substitution of modern switchgear, if not 'flame-proof,' at least fireproof, for wood framed, slate panelled switch gear; and the replacement of the motor resistances. These questions were submitted to the agent for his careful consideration." If further proof were wanted of some alteration in the law as to the person responsible for the installation and working of electrical apparatus in mines, surely it is supplied by the above. That no one has been killed, or no serious accident has occurred, is due to "good luck," as it certainly cannot have been by "good management." As regards the points raised and discussed, there ought not to be much difficulty, as ordinary commonsense indicates that all motor rooms ought to be ventilated with fresh air. Second, if the motor rooms are *in* the return airway, and nothing but safety lamps are allowed, then certainly General Rule 8 applies.

As to the third point, this is a very controversial one, but as has often been pointed out before, the *only way* to secure a reliable and efficient earth is to provide a separate earth wire, and see that it is kept in good order. It is probably equally good, however, to keep all "earth" off, and have the insulation so well maintained that the chance of any part being "earthed" is very remote. It is not so difficult to do this as may be imagined, if proper attention is given to details.

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As regards the last questions, ordinary commonsense dictates what ought to be done to render the switchgear safe to the operator, and the motor resistances must have been unsatisfactory or attention would not have been drawn to them.

At Ashton Moss Colliery it is also reported amongst "dangerous occurrences" that "insulation on the leads of a starting switch took fire, fire caused electrically in switch box." In all probability the starting switch has been too small or unsuitable for the work it was required to do. Cases are not uncommon of starting switches being used for "speed regulation," with, of course, unsatisfactory results.

Reference has already been made to Sir Henry Hall's remarks on "Electricity in Mines" so far as No. 7 district is concerned. One fatal accident occurred to a pump minder, who was killed by electric shock whilst attending an electrically-driven underground pump. It appears that the motor room was so badly planned, and so small—a very common state of things underground—that the attendant could hardly move without coming in contact with some of the cables, and these had been jointed in a very insecure manner, and apparently it was with one of these junctions, which had been, worn bare of insulating material, that the deceased had come in contact. "The installation so far as this motor house was concerned was a very clumsy piece of work." *Verb sap.*

Probably the most interesting of all the reports from an electrical point of view, is that of Mr. Walker, of No. 8 district, as the accidents are very fully dealt with as they "suggest means which should be taken to prevent similar accidents in the future," and, further, a copy of the printed instructions to persons in charge of electrical plant and machinery at Messrs. Barber, Walker & Co.'s Eastwood Collieries is given, which we regret would occupy too much space to reprint here. A copy of the report, however, may easily be obtained, the price being 7½d. Mr. Walker also states: "I find there is a tendency amongst users of electricity, when it is pointed out to them that their systems do not comply with the requirements of the electricity special rules, to reply that as the installations were in use before the rules came into force *they do not apply to them.*" It is satisfactory to note, however, that he has "in consequence, in some instances, given the agents and managers notice to comply with the rules." This is really very necessary, as if an accident does happen, it is "electricity" that gets the blame, and not the mishandling of this very useful form of power.

In regard to the accidents, the first occurred at Newdigate Colliery, resulting in the death of a "browman," whose duty it was to attend to sets of tubs near a motor house, and who at the time of the accident was replacing a derailed tub on the tram rails. "*A boy of 15 years of age was in charge of the motor*, and was giving the set a gentle pull; the deceased at the same time had hold of the tub for the purpose of guiding it. The boy switched on the current, but, hearing a shout, immediately switched it off again. Two men who were close by saw sparks at the wheel of the tub. *The only possible means of communication for leakage of electric current to pass to the tub was the haulage rope.*" Mr. Nelson, however, either by test or inspection could not find any fault or place of leakage, but was of opinion that the accident was undoubtedly due to the hauling rope becoming alive by a leak from either the motor or the leads in its neighbourhood. Mr. Walker also points out that the motor house was too small, and that the boy, although an intelligent lad, was too young to have charge of such an important piece of machinery. The following, however, is very important, as pointing to the difficulties in connection with obtaining a satisfactory earth. "The motor frame was earthed by means of an earth-plate 2 ft. square buried just outside the motor house, and when Mr. Hewitt (H.M. Assistant Inspector) first saw it, the ground in the vicinity was dry. In this condition it cannot have been a very satisfactory earth, and this probably is sufficient to account for the man receiving a shock, especially as he had his back against an iron pipe, which probably was a more efficient earth than the earth-plate in the dry ground."

The question of satisfactory "earth" crops up again in the second accident, which resulted in the death of two men at Clifton Colliery. In this case three-phase current is transmitted at 2,500 volts to within 750 yards of the face. At this point it is transformed to 500 volts, and conveyed by a single-armoured three-core cable; the armouring is used as a continuous earth connection for the gate-end boxes, frames of machines, and other electrical apparatus, to a copper earth-plate in the sump at the shaft. There are also auxiliary earth-plates on wet parts of the main haulage roads. The trailing cables of the coal-cutting machines are provided with four wires, one of which is for conveying to earth any leakage of current, by connecting it to the gate-end switch box, and through it to the armouring of the cables, and thus to earth. At the machine end, the trailing cable was fitted with a wooden plug containing three sockets, which fitted over the prongs in the coal-cutter terminal box. The earth wire was connected to a small brass plate at the side of the wood plug, and connection with the brass plate and frame of the machine was obtained by a ⅝-in. diameter bolt provided with a lever handle to screw it home. One of the deceased, who was driving the machine, got the trailing cable coupled up, but on turning the shorter switch into the first position, immediately received a shock which killed him instantly. The other man was by the side of the machine, resting his arm upon it, and he also received a fatal shock.

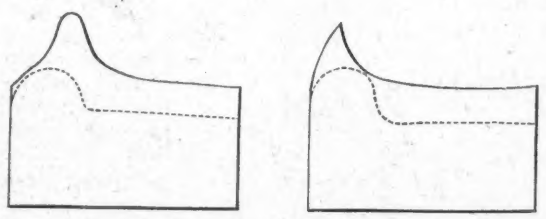
Subsequent investigation showed that the insulation of one of the loose leads from the stator windings of the motor had been worn through against the end of the casing by vibration, and had been making and breaking contact with the casing. The reason why the supposed efficient system of earthing the machine frame did not prevent the men from receiving a fatal shock, was that the contact between the plug and the casing of the machine was defective, owing to there being *no brass plate*, with the result that the bolt was bearing on dry wood, and the earth wire was therefore partially insulated from the frame of the machine. This accident shows the danger of relying on a continuous earth by connections such as this and the armouring upon the cables. At best the armouring is a poor conductor, and any break in the various connections to gate-end boxes, junction boxes, &c., makes the matter worse than if "earth" is kept off altogether, as it gives the men a false sense of security. The only correct and certain way is to lay a bare copper earth wire, and connect every part that requires to be "earthed" directly to it, and carry this right up the shaft to a large earth plate properly bedded on the surface.

(*To be concluded.*)

THE WEAR OF WHEELS.

By J. A. O'BRIEN, A.M.I.E.E.

In a recent number of a railway magazine there appeared the following illustration:—



Sections of Worn Tires, showing Amount to be Turned off to Renew the Flanges.

The title sufficiently explains the illustration. Of course there is nothing out of the common about it, but that very fact makes it worthy of note. It will be seen that in order to obtain a new flange on these wheels, which were shown as a fair sample of those used on British tramways, it will be necessary to turn down about ½ in. of metal from the tread of the wheel, and it seems a very curious thing that the necessity of wasting the tread to obtain a new flange is never commented upon. The usual maker's guarantee for steel tires is 5,000 miles per radial ⅛-in. The function of the flange is quite distinct from that of the tread; yet to

get the one we have to waste about 30 per cent. of the useful material in the other each time the wheel is turned down. True, that on some tramway systems many of the wheels are never taken off for turning during their useful existence, but in such cases the periodical use of wheel grinders in the sheds or emery blocks instead of brake shoes does the same thing.

Obviously the efficiency of the flange and the tread are the same, since they consist of one piece of steel, but obviously, also, the work they are doing is not at all equally shared. On the face of it, the function of the flange, which is to steer the car, ought to be much less onerous than that of the tread, which is to support the car, yet the rate of wear shows that the conditions are just the reverse of this. In fact, the absurd position seems to be that the side pressure of a car on the rails is greater than the vertical pressure. There really seems some reason for calling a wheel flange, as it has been called, one of the greatest inventions of the age; but, as a plain mechanical and commercial problem, the distribution of work over the different parts of the wheel tire could not be worse.

The question is, what exactly is wrong? To make a removable flange, if such a thing were practicable, would only be pandering to the unnatural conditions imposed on the wheels; by admitting that the lateral pressure of a car on the rails ought normally to be more than the vertical pressure.

This is just the point; the lateral pressure ought never to rise to even half the weight of the car. We should never tolerate such a condition of things in connection with road vehicles, and yet tramway truck manufacturers tell us that the construction of trucks has been carried as far as possible towards perfection. In the advertisements of the large truck manufacturing companies will be seen statements which clearly imply that such is the case. What, then, is the vital difference between a road and a rail vehicle which prevents high lateral pressures in the former and allows them in the latter. It is true that since a road vehicle has no rails constraining the direction of its motion it can skid laterally, and such skidding must certainly form a safeguard or automatic limit in many cases to lateral pressure on the tires, which would lead to overturning if it reached the full value corresponding to the side pressure; but it is hardly skidding that we look to to limit the lateral pressures on road vehicles. The dominating factor is the steering or constant change of direction of the vehicle. Suppose that a motor-car, with steering gear locked, so that it resembled the ordinary four-wheeled tramway truck, were pushed slowly against a kerb, at a slight angle to it. If the motion is dead slow, the side pressure against the kerb will rise to a point at which the car skids round more or less into line with the kerb, such side pressure being equal to the weight of the car multiplied by the coefficient of friction of the wheels on the road surface, and by a constant depending on the wheel base. But if the same car were run at a certain speed in the same way against the kerb, there would be the same side pressure due to frictional resistances of the wheels on the road, and in addition the pressure due to the kinetic energy now possessed by the car, the direction of whose motion has to be suddenly changed. This is the practical condition imposed on the unfortunate tramway or railway truck whose direction of motion is fixed, the kerb being quite analogous to the rail head against which the leading wheel flange presses as soon as the truck sets across the clearance space so as to run at a slight angle to the track.

The driver of the road car of course turns his steering gear on encountering the kerb to such an extent that the line of the leading wheels coincides with that of the kerb, when the lateral pressure ceases; and if the same method of steering could be adopted on a rail vehicle there would evidently be no flange wear due to side pressure of wheels against rails, and the wheels would wear through radially. There would, in fact, be no need for flanges. Since we cannot have those conditions, it seems only logical to suppose that we must look for reduction of flange pressures to the nearest possible approach to such steering. Suppose, for instance, that the road car had no hand steering gear, but was so hung that a slight side pressure on any of the wheels produced a change in direction by pushing the corresponding axle into a new position not parallel to the other axle. In such a case, the side pressure, analogous to flange pressure would exist, but to a very much less degree. For instance, if the road car then approached the kerb at a slight angle as before, the driver would have nothing to do but sit still and wait till the leading wheel on the kerb side touched the kerb and began to press on it. As soon as this happened the two leading wheels would be turned into line with the kerb by the side pressure, instead of by the driver, but this side pressure would evidently be very much less than that required to skid the whole car round, as at first described, where the car had no steering arrangements at all, provided that the friction of the mechanical arrangement permitting the axle to steer were small. The form of apparatus containing the least frictional resistance with practicability of construction, is a proper arrangement of circular swinging links, so set that when any axle steers it moves the links attached to it from their normal position, and this also presents the advantage of an automatic recalling arrangement. For, of course, we do not want the leading axle and wheels to remain fixed in their new position. As soon as the car in the course of running gets into line with the kerb, we should have the axles parallel again. If hand-steering is used, the driver will bring them parallel, and in the case of a link-suspended car with steering axles, the recalling action of the links tending to bring them back to their normal position, would do the same.

Now the action of running into the kerb is really what occurs continually with a rail vehicle, for it may now be looked upon as a fallacy that the flanges only come into use at long intervals. The diagram at the head of this article disproves that, without any investigations such as have been made of the actual line generated by a car body in motion (*vide* the article in the *Tramway World* of January 5th, 1910, by J. Sutherland Warner, on "Rail Corrugation"), and it seems to the author that no other logical method exists for the reduction of flange pressures than the construction of trucks on the principle described above. Of course, since it has taken us 10 years to be convinced that a 6 ft. 6 in. wheel base truck under a car body of 28 ft. overall is a bad mechanical arrangement, it is not to be expected that the commercial necessity for improving on the simple square frame on wheels, which still does duty under a heavy car body, will impress itself universally. But, meantime, wheels, axles and permanent way are being built with much more than the solidity necessary for their simple duty of transporting certain weights over a certain distance, and preference interests are being diverted to the payment of a correspondingly high rate of maintenance.

ELECTRIC PROGRAMME-RINGING CLOCKS FOR SCHOOLS, WORKS, &c.

The immense convenience of having a system of electric clocks throughout a school—or, indeed, any place where uniform time-keeping is essential—may be greatly enhanced by the addition of a bell-ringing programme apparatus attached to the master clock. We describe below an installation of this kind that has recently been supplied by the Silent Electric Clock Co. to the order of Messrs. Northwestern Electric, Ltd., Regina, Sask. (sole agents for these clocks in Alberta, Manitoba and Saskatchewan), a leading firm in Canadian electrical business.

Fig. 1 shows the mechanism contained in the master clock case. At the top is seen the arrangement for causing the bell on each dial throughout the school buildings to ring exactly at the pre-arranged times of the "programme." On the circular plate are 144 holes, each representing intervals of time five minutes apart. By merely inserting a peg into any—or all—of the holes, the bells are made to ring simultaneously at the chosen minute. The duration of the signal may be varied from three seconds up to a quarter of a minute by turning an adjusting screw. The master pendulum mechanism is, of course, the same as that described in our issue of February 4th, 1910, a relay being also provided for the bell circuit. The mechanism fitted on the door of the case is for operating the hands of the dial on the master case, and is in circuit with a similar movement on each extra dial of the installation. In the installation under notice, there are 16 10-in. oak clocks.

As, of course, the bells are not required at night, or on Sundays, a special mechanism (illustrated in fig. 2) is provided for the purpose of switching off the bells at such times; this consists of a wheel (actuated by a mechanism similar to that in the dials) revolving once in seven days, and divided into 14 spaces, at each of which there is a peg-hole. By removing one of the pins, the bell

circuit is put out of action until the next pin comes along—12 hours later.

The growing popularity of the bell-ringing master clock, with its subsidiary dials, is shown by the fact that this is the third such installation supplied by the Silent Electric Clock Co. for use in the province of Saskatchewan alone.

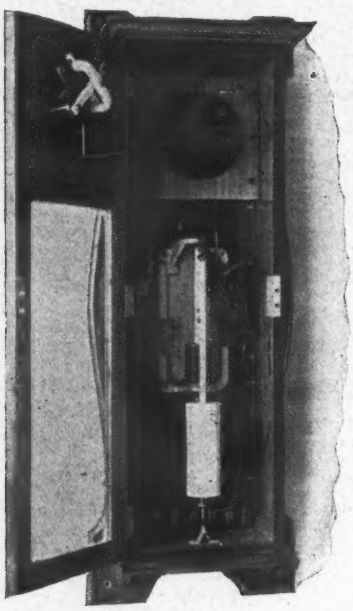


Fig. 1.

Amongst other orders now in course of execution by this rapidly growing firm is an interesting clock for the Aberdeen Town Council, which is to provide officially correct Greenwich mean time for the Aberdonians; it will automatically put itself in communication with the Post Office signal at 10 o'clock each morning, and

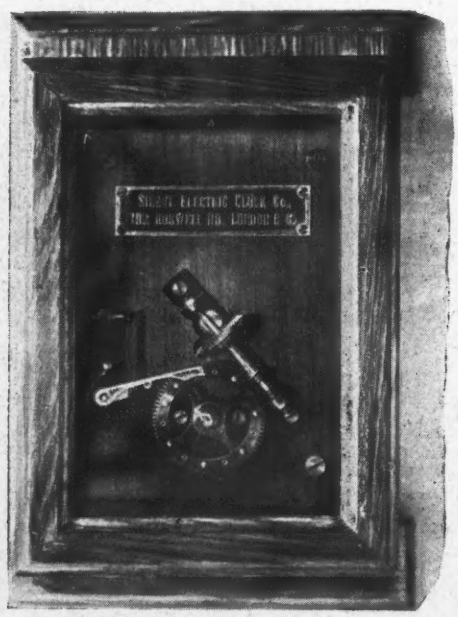


Fig. 2.

will hourly transmit signals to the Town Hall clock to ensure its synchronisation.

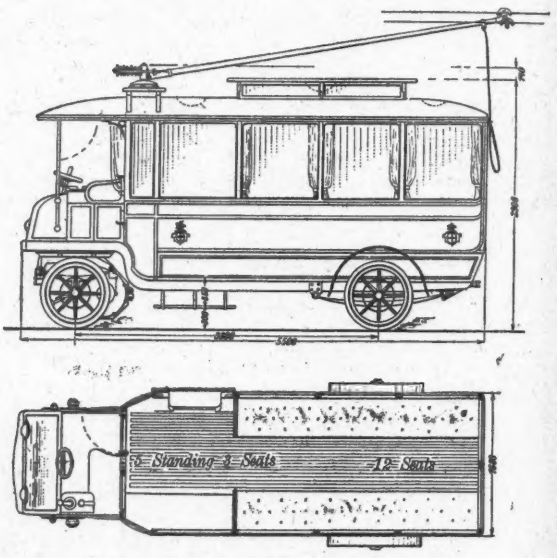
The new buildings of Waterloo Station (L. & S.W.R.) will also contain "Silent" electric clocks.

Harrogate Lighting.—The T.C. has decided to apply to the B. of T. and to the Knaresborough R.D.C. for permission to supply energy to premises outside the borough, and in the area of the Knaresborough R.D.C.

RAILLESS ELECTRIC TRACTION BETWEEN PIRANO AND PORTOROSA.

Another successful railless electric trolley line has recently been opened between the Adriatic towns of Pirano and Portorosa. It runs along a narrow coast road for about 3¼ miles, and already handles practically all the local passenger and goods traffic which was formerly carried by donkey carts and a horse omnibus. There is also a considerable visitors' traffic in the season, to and from the baths of Portorosa.

The double overhead line is supplied with direct current at 450 volts, obtained from a small station erected for the purpose, as well as for supplying the lighting of the hotels, &c., of Portorosa. Two-thirds of the distance is supplied with a double pair of supply lines, to allow uninterrupted traffic in both directions. Where the single pair of lines commences loop lines are provided. The only difficulty occurs at the point where both poles have to cross, and this is got over by introducing a short dead section some 14 in. in length. The current collection is effected by a double sliding contact piece supported on



Railless Electric Motor-Car.

a single rod and pressing upwards against the line with a pressure of about 15 lb. The supporting pole forms one lead whilst the other lead is formed by an insulated cable passing down the centre of the pole.

Owing to the many sharp bends in the road and the light nature of the road construction, the speed is limited to a maximum of 9½ miles per hour, and in the towns it is kept between 6 and 8 miles per hour.

The rolling stock consists of three motor-cars and two trailers (see the above diagrams). Each motor-car can carry 20 passengers, and weighs 2¾ tons unloaded. It is driven by a single 15-h.p. motor geared to the front axle so as to spread the load as equally as possible over the back and front wheels. All the wheels have pneumatic tires.

Messrs. Max Schieman & Co., the makers, guarantee the average annual consumption per motor-car-mile not to exceed ·55 kw.-hour. The cost of tires per car-mile is about 1·2d., and the repair and maintenance cost of the car is about ·5d. to ·7d. per car-mile.

The power station contains two 150-h.p. Lanzs compound semi-portable steam engines, one of which is a stand-by, and a battery.

The whole installation has met with the full approval of the inhabitants of the district—so much so, that the horse omnibuses have ceased running, and have been bought up by the owners of the new line, and are used, after alteration, as trailer cars.—*E.T.Z*

Electric Smelting in California.—Reports from the electric smelter at Héroult, near Redding, Cal., are to the effect that the smelter has been in operation since the middle of July. The output is said to be 20 tons of pig-iron a day, and the plant has been operated with entire satisfaction so far. A party of ironmasters and others from San Francisco recently inspected the electric smelter, and pronounced the demonstration a success. It is said that iron is made at a cost of $12 a ton, and that it is worth $30 a ton on the Pacific Coast. It is reported that nearly $300,000 has been spent in perfecting the installation, and it is now considered that the period of experimentation has passed, and it is said that five additional furnaces will soon be built.—*Electrical World.*

AUSTRALIAN COMMONWEALTH ELECTRICAL GOODS IN 1909.

We reproduce from the *Australian Mining Standard and Electrical Record* the following interesting particulars showing the relative values of the exports of electrical goods of various countries to Australia in 1909, and the possibilities in town lighting :—

TABLE I.

(Showing actual and relative values of exports of various countries to Australia.)

Class A—Accumulators, arcs and carbons, cables, instruments, tapes. B—Dynamos and motors below 200 H.P. C—Dynamos and motors over 200 H.P. D—Fittings, as switches and fuses; arresters. E—Generators for direct coupling to turbines (steam). F—Rheostats and controllers; switchboards (except for telephones). G—Electric and gas appliances N.E.I. H—Telephone apparatus.

	Class A.	Class B.	Class C.	Class D.	Class E.	Class F.	Class G.	Class H.	Total.
	%	%	%	%	%	%	%	%	%
United Kingdom	73	51	36	58	89	41	49	63	60
Germany	19	14	30	26	11	43	31	7	17
U.S.A.	5	30	31	14	—	12	10	4	15
Others	3	5	2	2	—	4	10	26	8
Total value	£222,500	£235,500	£32,300	£29,500	£29,200	£26,500	£126,100	£115,900	£817,400

The large percentage value of "Others" in Class H is due to Swedish telephone exportations.

TABLE II.

(Showing actual and relative value of Australian imports into the different States, thus indicating their comparative importance as consuming centres.)

	Class A.	Class B.	Class C.	Class D.	Class E.	Class F.	Class G.	Class H.	Total.
	£	£	£	£	£	£	£	£	
N.S. Wales	89,000	151,000	17,900	14,500	19,450	14,400	61,200	24,000	48 %
Victoria	83,000	31,500	3,900	5,700	200	3,500	33,900	58,400	27 %
Queensland	11,000	9,500	—	400	4,400	500	7,600	5,600	4·7 %
South Australia ...	21,000	33,000	8,400	7,000	950	6,300	13,000	14,700	12·8 %
West Australia	14,000	7,500	2,000	1,000	3,200	2,000	9,100	10,500	6·0 %
Tasmania	3,000	2,300	—	300	—	50	1,300	2,700	1·5 %

TABLE III.

(Showing the actual and relative values of goods transferred by each State to all the others; this indicates the importance of each State as a distributing centre.)

	Class A.	Class B.	Class C.	Class D.	Class E.	Class F.	Class G.	Class H.	Totals.	%
	£	£	£	£	£	£	£	£	£	
N.S. Wales	15,400	14,600	1,400	2,020	30	650	15,400	2,050	51,450	51
Victoria	28,300	6,000	630	1,200	30	1,400	10,000	2,000	34,300	34
S. Australia	4,600	1,500	630	300	900	950	1,600	500	10,900	11
Q., W.A., T.	2,000	1,200	90	50	400	50	1,000	500	5,300	5
Total	£50,300	£23,300	£2,750	£3,570	£1,360	£3,050	£28,000	£5,050	£101,950	

Note.—Of these there are included £880 of Australian manufacture.

In 1909 Australia exported electrical goods to New Zealand as follows :—New South Wales, £14,000. Victoria, £9,000.

TABLE IV.

(Showing the number of towns and cities in Australia with a population of over 1,000, thereby exhibiting possibilities in town lighting. Only a very small proportion have electrical supply.)

Population.	N.S.W.	Victoria.	Tasmania.	S.A.	Queensland.	W.A.
Above 1,000, under 2,000	34	35	5	—	13	1
„ 2,000, „ 3,000	25	13	1	5	14	4
„ 3,000, „ 5,000	19	13	1	1	7	6
„ 5,000, „ 10,000	5	3	—	1	7	1
„ 10,000, „ 15,000	1	1	—	—	5	2
„ 15,000, „ 20,000	—	1	1	—	1	1
„ 30,000...	1	2	1	—	—	—
Capital population	500,000	550,000	37,000	181,000	140,000	51,000
Total population	1,700,000	1,300,000	183,000	410,000	510,000	280,000

A San Francisco Hotel Plant.—The equipment of the Palace Hotel, San Francisco, formed the subject of an illustrated article in the *Journal of Electricity, Power and Gas* recently. The hotel, a nine storied building, has been rebuilt since the earthquake and fire, and now covers 2½ acres in the heart of the city.

The electro-mechanical equipment includes a 900-KW. electric lighting and power plant, telephones, bells, clocks, &c., a pumping plant for elevators and house service; water filters and storage; ice making and refrigerating plant; direct and indirect heating and ventilating plant; and vacuum scrubbing and sweeping apparatus. The engine room floor is some 30 ft. below street level; the plant includes three Babcock boilers for 200 lb. pressure fitted with superheaters, and fed with crude oil fuel, having a calorific value of 18,500 B.TH.U. per lb.

Seven main oil storage tanks of 497 barrels capacity are provided outside the building under the sidewalk, and in order to comply with local by-laws, the oil is pumped *down* to an auxiliary tank below the level of the burners, to be afterwards pumped again to the latter and to the burners in the kitchen ranges. The fuel and steam pressure regulation is automatically controlled.

The generating plant consists of three 300-KW. Westinghouse 250-volt three-wire machines, direct-coupled to cross-compound engines; balancing coils for balancing the load on each side of the three-wire system are provided. A steam-driven surface condensing plant, two steam feed pumps, two feed heaters and an oil filter are installed. A 17-panel switchboard is provided, which includes seven lighting feeder and two power feeder panels, and is fully equipped with illuminated dial instruments, 5,000-ampere and 2,000-ampere recording wattmeters being provided on the lighting and power load panels respectively. Main feeders run from the switchboard to distribution boards placed in riser shafts—six of these boards being found on a typical floor; from these boards, circuits run to room and corridor lights—the system of dividing the lights in individual rooms between two circuits, which has found favour in this country, is generally adopted, although the description does not indicate that the circuits are fed from distinct feeders, as is often the case here. The lighting is balanced on the three-wire system with 220 volts across the outers, and several two-wire 110-volt circuits are left for hand-balancing, if necessary.

The power-wiring is on the two-wire 220-volt system, and is fed from various load centres in the building; the load centre panels carry the switches, starting rheostats or controllers for all motors to which the boards distribute energy, and are fed direct from the main switchboard. The principal power load appears to be the ventilating fans, numbering 20, and totalling about 130 H.P.; the ammonia compressor of the refrigerating plant is driven by a 50-H.P. motor, and other small motors are in use, but the 11 lifts are of the hydraulic type, and the pumps are practically all steam driven.

Energy for operating the telephones, and the bells, fire-alarms and clocks, is obtained from two batteries, which are charged from the switchboard, and the latter, we note, contains a panel for an emergency supply from the San Francisco Gas and Electric Co. The description, unfortunately, makes no reference to the systems of illumination which have been adopted.

Mexican Light and Power Co., Ltd.—The annual meeting was held at Toronto on 5th inst. The chairman stated that the storage capacity had increased, and 20,000,000 cb. metres of water were now on hand. The business prospects for the coming year were excellent. The net revenue for the year was $2,426,811. After paying management and fixed charges, and dividends of 7 per cent. on the preference shares and 4 per cent. on the common stock, $149,385 was carried forward.

PROCEEDINGS OF INSTITUTIONS.

Ductile Tungsten.

The following abstract of a paper on "Ductile Tungsten," presented before the American Institute of Electrical Engineers by Dr. W. D. Coolidge, of the Schenectady Laboratory, is reproduced from the *Electrical World*:—

Dr. Coolidge stated that when work on the production of ductile tungsten was first started in the laboratory, not only was there nothing in the past history of tungsten for encouragement, but, in the natural periodic system of the elements, the metal belonged to a family no member of which had been brought into a ductile state. The other members of the family are chromium, molybdenum and uranium, elements which had always been characterised by hardness and brittleness. A study of the periodic system shows that, in a general way, elements of the same family do resemble one another in point of ductility, as well as in their other physical and chemical properties. For example, copper, silver and gold are all in one family, and are all very ductile. Little encouragement, moreover, could be drawn from the achievement of Dr. von Bolton with tantalum, because of the fact that this element is in a different family, and the two families differ markedly in both physical and chemical characteristics.

A number of experiments were described, which, while leading to several new and valuable methods for producing tungsten filaments of the usual quality, did not give much promise for the solution of the problem of obtaining a ductile tungsten filament. They were, however, in one respect instructive, for they enabled a complete removal of the foreign elements, at least so far as analytical tests showed, with the final high temperature treatment of the filament. This seemed to indicate that one either did not need to worry about contamination from such elements, or else that brittleness was due to traces of impurity so minute as to escape detection by our analytical methods.

In the mechanical working of pure tungsten a great impetus was received by the discovery that an ordinary, dense, well-sintered, tungsten filament can be easily bent and put into various forms, and otherwise manipulated at temperatures well below redness, and even below the temperature at which appreciable oxidation takes place. This helped in two ways. First, it reduced the temperature at which mechanical working operations could be carried on, and, second, it gave a means of recognising which of the mechanical and chemical processes involved in the experiments were leading nearer to the goal. Anything which reduced the temperature at which the metal could be permanently bent was, clearly, an aid.

It was found that steps tending to the elimination of the last traces of certain impurities did greatly improve the resulting product. While it may be true that certain impurities present in small amount are harmless, or even helpful, certain other impurities were known to be detrimental. It was also found that a certain micrographic structure, in the initial tungsten rod, was conducive to mechanical working and to ductility in the resulting product. Once arrived at the point where mechanical working was easy and where there was a certain amount of ductility in the product even when cold, the development became more rapid. It was aided by the construction of more refined apparatus, in the design of which care was taken to guard against the taking up of impurities during mechanical reduction processes, both from the atmosphere in which the work is carried on and from the surfaces of the tools.

Hand in hand with this improvement on the mechanical side has gone the work on greater chemical purity of the metal at starting. One of the difficulties in purifying tungsten has been due to the fact, which has been pointed out by Smith and Exner and others, that tungstic acid is prone to form difficultly separable complexes. Because of this tendency, especial care must be taken with regard to the purity of the re-agents used, as otherwise recrystallisation beyond a certain point does not result in corresponding purification.

The knowledge obtained from the various lines of research carried out now makes it possible to prepare tungsten which can be mechanically worked without more difficulty than would naturally attend the manipulation of very fine wire. The product is a perfectly pliable ductile wire, which has the strength of steel. It gives a lamp which is strong and whose filament retains its ductility throughout the life of the lamp.

The following data on the drawn wire, obtained from measurements made in the laboratory by Dr. Colin G. Fink, were given :—

Diameter (in inches).	Tensile strength (lb. per sq. in).	Specific gravity.
·150	—	19·30
·005	490,000	—
·0028	530,000	—
·0015	600,000	20·19

The electrical resistivity at 25° C., expressed in microhms per centimetre cube, is for the hard-drawn wire 6·2, and for the same annealed 5·0. The temperature coefficient of electrical resistivity between 0° C. and 170° C. is 0·0051* per degree Centigrade.

The above values, with the possible exception of the temperature coefficient, are somewhat dependent on the early history of the wire from which they were determined.

In conclusion, Dr. Coolidge stated that the work outlined in the paper is the result of the close co-operation of about 20 trained research chemists, with a large body of assistants, in the research laboratory, who received from the factory organisation all of the mechanical and electrical assistance they could use, and were assisted in no small measure by the staff of the incandescent lamp factory.

* In the abstract of a paper by Dr. C. G. Fink, this was incorrectly printed as 0·0091

Institution of Mining Electrical Engineers.

On July 25th the members of the Cumberland Branch of the Association of Mining Electrical Engineers held their second inspection visit of the season, a party visiting the Glenridding Lead Mines, on the banks of Ullswater.

The mine power station is equipped with two turbines of 100 B.H.P. each, working under a 300-ft. head of water obtained from the slopes of Helvellyn and the dams of Capple Cove and Red Tarn, about two miles distant. The turbines were supplied by Messrs. Gilkes—one a Vortex type, and the other a Pelton wheel, both running at 1,000 R.P.M. The generators are 70 KW., direct current, compound wound, belt-driven at 600 R.P.M. from the turbines. Each generator works at 600 volts, and supplies two pairs of mains, 19/15 B.W.G., which carry the current to the mines, 2¼ miles distant. The cables underground are rubber-insulated and carried on insulators to each junction-box, whence leads are taken to the various motors. Underground there is fixed an air-compressor supplying air for rock-drills at 60 lb. pressure ; this machine is driven by belt from a 40-B.H.P. compound-wound motor. Near the compressor there is a winding motor of 40 B.H.P., which hoists the ore in cages from the lower levels to the adit level ; here an electric locomotive takes the loaded wagons to the surface, a distance of 1¼ miles, hauling a load of 20 tons. On the top of the shaft, close to the winder, there is a 10-H.P. series-wound motor used by sinkers. The total depth of shaft is 450 ft., 7,500 ft. from the surface. At the 60-fathom level there is a three-throw pump driven by a 10-H.P. motor working under a 360-ft. head, pumping 3,000 gallons per hour. At the 90-fathom level there is a similar pump. The whole of the water runs out of the adit by gravity. Underground there is fixed a transforming station to convert the 600-volt supply to 250 volts for the locomotive, which derives its power from two overhead hard-drawn copper wires, No. 000, B.W.G. section. The locomotive has a series-wound motor, 20 B.H.P., and runs at 5 miles per hour loaded. The whole of the works are lighted by electricity above and below ground. There has never been any person injured by electricity since its application, and no serious breakdown.

There is fixed at the surface a motor-generator to give 300 volts for driving the locomotive. Should any repairs be required to the transformer underground, this machine is driven by a turbine ; the armature is so constructed that when in series it will give the higher voltage, and when in parallel 150 volts for lighting the works at the surface. The various dressing machines are driven by water power, of which there is a large quantity.

The party were the guests of Messrs. W. H. Borlase, sen. and jun., and after dinner Mr. W. H. Borlase, sen., said that the company had tried hydraulic power and compressed-air power ; it was decided in March, 1891, to place a contract at a cost of £5,000 to install an electrical plant, and by Christmas of that year the plant had saved the company £300 on their previous working. Although this plant had been working for a period of nearly 20 years, the armature on the generator was the original one installed, and the field coils had only once been re-wound. The plant was so successful that it was afterwards decided to provide an electric locomotive at a cost of £1,200 ; this was so satisfactory that at the end of 12 months it had effected an economy of £800 in the driving expenses (doing away with the use of horses, &c.), and since its installation had never lost a day's working. The armature on this locomotive had not been changed for the last three years. He thought this spoke well for electrical plant in connection with mining.

Mr. Borlase, jun., said he thought that the satisfactory working of the plant and the small expense in the cost of maintenance were due chiefly to those who were in charge of it. He thought it would be to the advantage of those who had electrical plants to keep in mind the objects of the Association, and not be led astray with the idea that the plants would run without attention and proper supervision. It was essential that men in charge of plants should be thoroughly competent to take charge of them.

Mr. J. Glynn Williams, replying to a toast, said the Cumberland Branch represented the smallest mining district in the United Kingdom ; it only included 34 collieries, but had a membership of 51. There were nearly 4,000 collieries throughout the kingdom, and if the other branches would bring up their membership to the present standard of the Cumberland Branch the Association would then have a membership of about 6,000. At the present time, unfortunately, there were only about 700 members, but even this was certainly very creditable considering the short time the Association had been formed.

Argentine.—A somewhat astonishing report on the temporary failure of the illuminations during the Centenary Festivities, has been issued by the Buenos Ayres "Director of Public Lighting." The primary cause of the trouble seems to have been several strikes, which were got over by employing casual labour ; ultimately, when inspected, the installation in Avenida de Mayo, and Calle Florida, disclosed very numerous defects, which, it is suggested, were planned purposely, and which took a long time to remedy, owing to the hostility of the workmen. When this matter had been put right, accidents occurred in the generating stations of the Compania Alemana Transatlantica, a main switchboard being destroyed, and 20,000 H.P. of machinery thrown out of service through some criminal action by an undiscovered person. However, the troubles were eventually overcome, and according to the *Review of the River Plate*, the illuminations have since attracted great attention in the city.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Large Voltmeter.

The accompanying illustration shows an unusually large sector pattern voltmeter, of which a number have been made recently by Messrs. Everett, Edgcumbe & Co., Ltd., of 117, Victoria Street, S.W. In appearance it resembles other instruments of similar type, but it is believed to be the largest ever made anywhere, the scale being no less than 25 in. long. These voltmeters are employed in

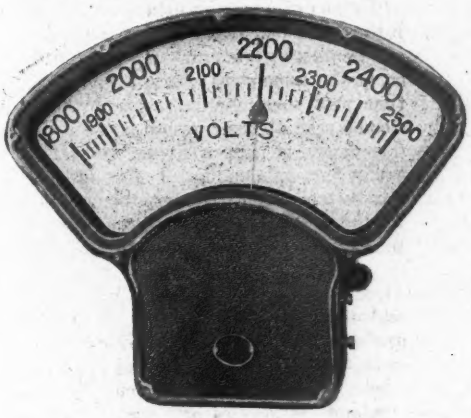


Fig. 1.—Voltmeter with 25-in. Scale.

large central stations to enable the engine-driver to read the voltage from any position in the engine room; in one station, supplying both A.C. and D.C., two of them are fixed side by side, one (that which is here illustrated) for A.C., and the other for D.C. Having regard to the exceptional length and mass of the moving parts, a special design was necessary; the makers inform us that they have succeeded in making these instruments as dead-beat as an ordinary 6-in. dial instrument, in spite of the difficulties of the problem.

Western Electric Telephones.

The extent of the telephone industry is well exemplified in the new illustrated catalogue of telephone apparatus and supplies just published by the Western Electric Co., North Woolwich, London. This is, undoubtedly, one of the most comprehensive and detailed lists yet issued, dealing as it does exclusively with apparatus employed in telephone work.

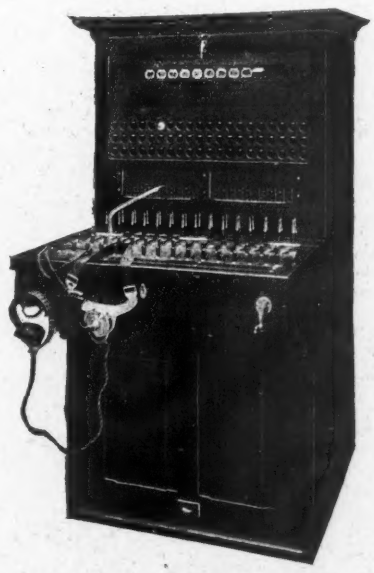


Fig. 2.—Private Exchange Switchboard.

Apparatus ranging from that employed in the largest exchanges down to that adapted for domestic purposes, is fully described and illustrated, also telephones for mine, tramway, police and ship service. Prominence is given to the C.B. or central battery system, which was originally introduced by this company, and which has been almost universally adopted for large telephone exchanges, owing to the speed, efficiency and simplicity, obtainable in operation.

Some of the large public C.B. exchange switchboards built by this firm are illustrated in the catalogue, and we reproduce herewith, fig. 2, a type used in smaller installations, such as hotels, factories, &c.

The interphone, of which we give an illustration in fig. 3, is a most compact instrument for private installations, and provides

Fig. 3.—Interphone.

complete intercommunication between a dozen stations, the only movement necessary being the pressing of the button required.

Fig. 4.—C.B. Wall Set.

The metal C.B. telephone set, which we also show in fig. 4, is another new feature amongst many others described in this volume of over 300 pages.

The "Isogrip" Lampholder.

We illustrate herewith a new-pattern lampholder which is being introduced by Messrs. Ward & Goldstone, of Sampson Works Salford.

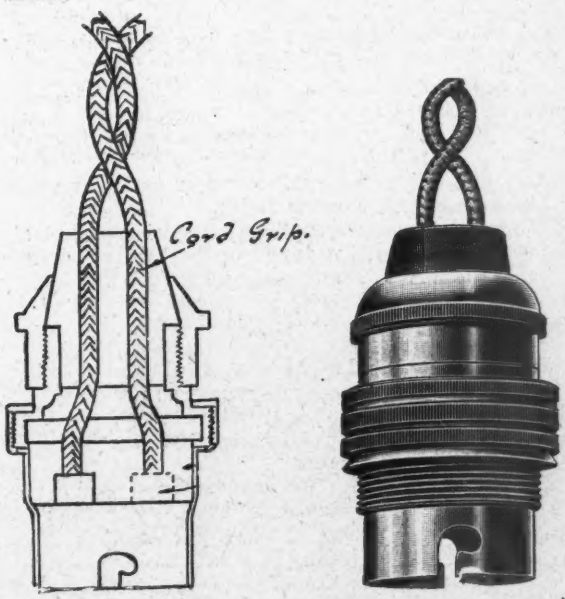


Fig. 5.—Sectional and Exterior Views of the "Isogrip" Lampholder.

As will be seen, the feature of the "Isogrip" lampholder is the cord grip, which is of considerably larger dimensions than the ordinary pattern grip, and is constructed in three parts, one of which forms a separator between the two conductors and holds them well apart. The arrangement is a simple one, and as it obviously does away with possible risks of overheating, short-circuiting, &c., of the flexible at the point where it enters the lampholder, it will doubtless appeal to contractors and those interested in electrical installation work.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Overcrowding in the Ranks of Central Station Engineers.

I have read the letter by "D. E." on the above subject with considerable interest; whilst agreeing with him that central station engineering is overcrowded, I do not share his opinion on behaviour and engineering abilities of the ex-premium pupil.

My experience of these men is that in the majority of cases a man does not enter a central station as a pupil until he has had some previous technical training or apprenticeship, and in some cases both, extending up to periods of five years. After their 12 months' premium pupilship, they are generally taken on the staff at some ridiculous wage, more suited to the qualifications of a day labourer.

The person who is pushed into a central station by influence, and continues to rise by the same cause, is the exception, as a large majority of premium pupils enter stations outside their native towns, and, instead of "loafers," they are found to be interested and earnest workers in their profession.

The administration of a central station in which a man is allowed to loaf away his time and "generally act the goat," must be somewhat of the slackest; and whilst admitting that central stations, in common with any other classes of works, get their share of "slackers," yet it is my contention that the majority of the premium pupils are earnest tryers, and make good central station officials, for the simple reason that their earliest experiences are gained in a central station.

The suggestion for a Board of Trade examination is a good one, and by no means new, but may we not look to the I.E.E. in the near future to conduct examinations on its own account?

Examinations are no cure for overcrowding, as the legal, medical, and maritime professions bear evidence, nor are they a definite guarantee of excellence. On the other hand, overcrowding in central stations is largely due to the glamour of public service which lends, in some people's estimation, a cloak of super "respectability" and solidity, such as belongs to the office of churchwarden and similar eminences. The public servant, if he reaches a position of responsibility, is occasionally in the public eye, and the report of his presence at such and such a convention is read by the youthful aspirant to equal distinction, with the result that the latter gets an inflated idea of the importance of municipal work and clamours to enter a central station.

The fact that municipal appointments are independent of the conditions of general trade removes the element of chance which is such a spectre to the unspeculative mind.

A.

With regard to Board of Trade examinations and granting of certificates to central station engineers, as suggested by "D. E.," everyone concerned will, I should imagine, welcome this idea as a sound, fair and just one; it should be the means of placing men in their proper positions according to their merits. The central station apprentice will then have to compete without the influence and aid of his councillors, friends, &c., so what does it matter how many are enrolled each year if they have to stand down through lack of training and experience?

Premium pupils will be scarce when failures are properly exposed; besides, there is yet another grievance it will help to solve—the question of the "steam man" who, as often as not takes charge of electrical plant, knowing little or nothing about it. There is nothing more annoying for a switchboard attendant than to be compelled to accept a small salary (this in itself settles his capabilities to outsiders), take the responsibility, and knuckle under to a man who cannot advise him when trouble is brewing, and finally see him walk out of the station in possession of a good testimonial, having secured a "better" position, leaving the switchboard attendant to grind on in the same old groove. There's no denying that this practice is becoming general in some fair-sized stations. By way of cheering himself a little he may glance through the advertisements and find something like this: Vacancy occurs for premium pupil to qualify for junior assistant, and in some cases even chief assistant.

It is high time that something was done whereby competent persons could take up their respective positions with confidence and command at least a living wage. I am not alone in expressing this opinion, and I also feel sure that many would only be too glad to content themselves with a humble position, though qualified for a better, provided there was some genuine system of graduation and a salary at the end of it.

Unfortunately these suggestions all die a natural death, and the same old state of affairs continues. I am of opinion that most central station engineers are so disgusted with the whole business, that they will not even take up their pen and express their views, much less come forward in a gentlemanly way, and settle once and for all, such a sore question. Surely there is a way.

J. P.

In your issue of August 12th, "D. E." refers to the overcrowding in the ranks of central station engineers, and apparently throws all the blame on the central station trained man.

How about the hundreds of pupils and apprentices who serve their time in the workshops, with the ultimate intention of joining the ranks of central station engineers; are they not equally guilty, if guilty they may be called?

The whole gist of "D. E.'s" letter seems the belittling of the electricity works trained man; whilst I am perfectly aware there are many useless men trained in this way, surely you will agree that there is also an equal number of useless men who emanate from the workshops: there are black sheep in every flock.

I should like, now, just to deal with the various points raised by your correspondent.

He states ". . . . these pupils spend a year . . . . and are then electrical and mechanical engineers." This may be true in some cases, but many young men, whose parents are not in a position to put their sons into the "shops," enter a central station, serving several years at one, and again many years at others; during this time they pass through each and every department.

We take it that every engineer's ambition is to eventually become a chief, so that a young man must take care not to rush through the various departments, but to be content to remain in each, until he has had sufficient experience in that department to form a groundwork for further experience, which is, in turn, going to fit him for a "chief." Does the central station pupil "loaf" any more than the workshops pupil?

"D. E." seems to forget that the average central station apprentice wishes to get on, the same as other apprentices, and for this reason, as soon as he has finished his apprenticeship, for many do serve them, being properly indentured, he seeks a junior position elsewhere, to widen his experience (I do not refer to the "pets" of central stations), and so consequently joins the ranks of junior engineers, and stands with the others on his merits, and competes fairly with them for a position in the electrical world.

He goes on to say, "There is now one more wage," &c., and there is not one man per station who dies. He overlooks the fact that the demand for electricity increases from time to time, and consequently works are extended, and naturally a larger staff is sometimes required.

Again, how many men trained (?) in one station ever reach the chief's position?

Surely he will not complain of a central station trained man (trained, I say,) who has been through many stations,

gaining experience in all branches, capable both practically and theoretically (for *even* central station men do study theory), for holding a chief's position, should he prove himself competent.

Then he says, ". . . . the engineer advises his committee. . . . . What is his knowledge to advise upon? . . . he has none."

May I retaliate by saying, what experience has the average works man as regards the business portion of a central station—publicity, systems of charging, and the general office work of a station—for the central station man must be both an engineer and a business man; also, the man who has served his time with a mechanical firm, and then come into a central station, starting with a position as junior switchman, as many do, what does he know about mains? No one will teach him, unless he be a pupil at the said works.

Surely the works man must go into a central station, and get experience as a pupil in the various branches that are new to him; but "D. E." says a central station is no place for a pupil.

He goes on to say, "What does he know about drives?" Equally as much, I say, as the *average* works-trained man: either will make it his business to study this branch, if he previously has had no experience in same, should the necessity arise.

I agree with him when he says that the lowest official should already have a good and varied experience, but provided his experience is good, and he proves himself a capable man, do not reject him, because he happens to be central-station trained.

The idea of the Board of Trade issuing certificates is excellent, and would, no doubt, keep the half-trained men out, and give the good men the chance they deserve and have paid for.

I do not wish to imply that the central station man is superior to the works man—rather the reverse. Nothing can be better than a good works training, both electrical and mechanical, with a college course; but if a young man intends to take up central station work, I consider it imperative that he should go into a station and pass through each department, spending longer in the departments in the work of which he has not previously had any experience. But to many young men this is impossible, for their people cannot afford the heavy premiums demanded by most firms of standing, so that they have to content themselves with beginning and finishing in central stations, and I contend that if they stick to their work, and pass through each department in the station in which they serve their time, spending a reasonable amount of time in each, especially the workshops, where they get experience in the actual running repairs to all kinds of plant, and then pass out to another station in a junior capacity, and, again, pass from station to station, choosing a different class of work in each as far as possible, at the same time attending a technical school and reading up at home, if they cannot afford a course at a college, then, I say, they are worthy of, and have a right to, the title of engineer.

There appears to be too much of the "where have you been?" and too little of the "what can you do?" in England. In the Colonies—some, at any rate—provided you can prove that you are not an amateur, and that you have had a decent training, you are given a chance; but in England, if you can state "I have been with Messrs. So-and-So," and they are a large well-known firm, you are considered to be all right, when perhaps you are one of the loafers to whom "D. E." refers.

I might say the city electrical engineer of one of the largest stations in England stated that, personally, he preferred central station men, but that, for the higher positions, he chose workshop men, to satisfy the B. of T. in case of any accident.

It would be interesting to hear the opinions of some of the leading engineers, and I hope we may see the same in your journal. The object of this letter is not to compare the central station men with the workshop men, but merely to defend the former, as I think they are worthy of a little consideration, and are not all loafers, as "D. E." would have us believe.

How many good engineers could we find who have had no workshop training outside a central station? Many, I believe.

Electrical Engineer.

Another Injustice to Station Assistants.

I should like to ask those of your readers who, like myself, are assistants in a central station, if they ever have experienced difficulty in making a change from their present station; also, what they think is the real reason that they are not successful in gaining another appointment, in spite of the fact that they are continually putting in applications for new appointments, these applications to all intents and purposes being energy wasted in writing them out.

I was speaking to a very well-known engineer a few days ago, and explaining to him how heartily sick I was of the station I am at present working in. I gave him the particulars of my past experiences, and, perhaps, I may be forgiven if I repeat them here. I served my apprenticeship with a good all-round electrical and mechanical engineer, passing through his mechanical and electrical departments. I was also three years with some large cable manufacturers and contractors, and I have had 10 years' good sound central station practice, consisting of alternating-current (single, two and three-phase), and direct current for lighting purposes, as well as traction supply.

I was, indeed, very much surprised at the answer that I received from the above-mentioned engineer. He told me that it was not my past experiences that told in my case, but what did tell was the station I was at present engaged in, as my chief was very much disliked by the majority of station engineers owing to his manner of running a station, which, in itself, was most extraordinary; consequently, when one of this particular chief's assistants put in an application for an appointment, his (the assistant's) application finds a resting-place in the wastepaper-basket.

Surely, if this is true, it is a most awful thing; why should the sins of a chief be visited upon his assistants? The majority of assistants know right from wrong, but they are absolutely bound to obey their chief, whether he be in the right or in the wrong; consequently, their hands are tied.

I am sorry to confess that what I heard of my chief is but too true, as in one particular instance which I, personally, am concerned in, my chief's way of carrying out a certain test is wrong; consequently, the method which he adopts makes the test come out "no good." I have carried out the tests at my previous stations, and having used the proper method have got most satisfactory results. I have tried to point out the mistake to my chief, but instead of getting thanks for doing so, I have received another kind of thanks, which shall be nameless. I will leave my brother engineers to draw their own conclusions. Needless to say, I do not make any suggestions nowadays.

Perhaps some of your readers will say, "Surely you know the cure; why don't you arrange for a meeting between the other assistants and yourself, and point out to the chief the mistake he is making?" That is just where the difficulty lies. In this station there are over a dozen officials, and out of these there are only two you can really call good all-round men. The rest do not care a hang what instructions are given to them by the chief; they carry these out, and, in fact, do anything, no matter what it is, as long as they remain in the chief's good books.

Might I ask those chiefs who read these lines, when they advertise in the future for assistants, and perhaps receive an application from an assistant who is at a station where the chief is very much wanting, to kindly cut out the assistant's present experience and look more closely into his past experience? If this is done, I feel sure that a great benefit will be felt by the community at large.

A Poor Unfortunate.

Street Lighting in the City of Westminster.

It is being persistently reported in the public Press that the City of Westminster have displaced electricity by gas for street lighting throughout that city. This statement, however, is untrue. The facts are as follows:—

The Westminster City Council transferred the lighting of that part only of the City of Westminster which has been

hitherto very efficiently and economically lit by the St. James' Electric Light Co., to the gas company. This lighting comprised the supply to 66 arc lamps. The Westminster Electric Lighting Co., under contract, are still supplying, and will continue to supply, until 1931, 970 arc lamps, and the Charing Cross Co., under contracts which do not expire for some years, 165 arc lamps in the City of Westminster.

It will be seen, therefore, that about 5¾ per cent. only of the lighting previously carried out by the electricity supply companies has been entrusted to the gas company.

These figures speak for themselves, and need no further comment on this head. When, however, so much attention is being called to the difference in the prices quoted by the electricity supply companies and the gas company respectively, it is only fair to the former that the conditions under which the respective prices were quoted should be understood and appreciated, and I therefore call attention to the following points :—

The electric supply companies were invited at considerable capital cost, to enter into a contract for five years determinable at the expiration of that period at the option of the City of Westminster without compensation of any kind. Prices were also invited alternatively for 10 and 15 years' contracts.

By the terms of the specification, the electricity supply companies (the gas company's network of street lighting mains already covered the entire area) were compelled to quote for the *whole* of such specific district or districts as might be within their particular area of supply. The City of Westminster Council on their part reserved the right *to select any part or parts* of those districts for lighting by electricity to the exclusion of other parts of the district, at the contract price per lamp quoted for the whole district. It is obvious, therefore, that the electricity companies, in the event of the exclusion of parts of the district might suffer serious loss.

The concessions of the electricity supply companies expire in 21 years, and all capital charges would have to be provided for within that period.

The gas company is not purchasable by the local authority, and has therefore a practically unlimited period in which it would be possible to deal with capital charges.

The furnishing of the supply by the electric light companies would have necessitated the laying of additional cables and the construction of other works involving a very large capital expenditure.

With the gas company, as to the greater portion of the work involved, mains were already laid and capital expenditure made.

The terms of the specification imposed by the Westminster Council were thus (unintentionally, no doubt) exceedingly unfair to the electric lighting companies, and owing to existing conditions were relatively favourable to the gas company.

In circumstances such as these, could the electric light companies do otherwise, on business lines, than safeguard their shareholders' interest by making provision for these capital charges and contingencies in the price quoted per lamp ? What could have been done if the specification had been framed so as to allow the companies, as well as the City of Westminster, to select convenient portions of districts for tender, is evidenced by the fact that the St. James' Co., owing to matters which transpired at the Westminster City Council meeting of April 14th last, offered to continue their supply to the section then lit by them at a price which compared not unfavourably with the gas company's. Their request, although supported by nearly the whole of the principal shopkeepers in the area was refused on the ground that it had already been decided to place the contract with the gas company.

It has also been published abroad that the City of Westminster will effect very large savings by the arrangement with the gas company. This is not accurate qua-electric lighting. The City of Westminster in this connection is saving only the small difference between the low price charged by the St. James' Co., and the cut prices offered by the gas company. If, therefore, a saving is being effected, it is probably due to the drastic revision of the gas company's own price for the supply they themselves have hitherto given in the City of Westminster.

The question whether or no the contract will pay the gas company other than as an advertisement is, of course, one for themselves and their shareholders, but an analysis of their published accounts would appear to show that their costs are 1s. 10d. per 1,000 ft., while the contract price, which includes capital charges for street work, would appear to yield certainly not more than 10½d. per 1,000 ft., as against 2s. 8d. per 1,000 ft. charged to the general public. Would it be very unfair to deduce that considerations of advertisement and preference had an undue bearing upon the composition of the prices tendered by the gas company ?

To put the matter shortly, making allowance for the considerations mentioned in the preceding paragraph, the whole of the difference between the prices tendered by the gas company and the electric lighting companies respectively is due to this question of capital charges in connection with the short unexpired periods of the provisional orders, the duration of the proposed contract (five years), and the handicapping conditions imposed by the terms of the tender upon the electricity supply companies, and not in the price at which electricity could be sold under ordinary and reasonable conditions.

The Charing Cross, West End and City Electricity Supply Co., Ltd.

Edward Wilmot Seale, *Secretary.*

London, W.C., *August 20th*, 1910.

Tramway Management—An Engineer or Otherwise.

In the discussion on Mr. J. R. Salter's paper on "Tramway Economics" at Dublin, the question of tramway management was raised, and Mr. Mallins, manager of the Liverpool Tramways, contributed some remarks directed against engineer managers which were certainly uncalled for. The manner in which these remarks received criticism later on, shows pretty well the feeling of the meeting with regard to same. They were distinctly damaging to those who happen to be electrical engineers and tramway managers, and I am surprised that others have not come forward to still further question these. Among his remarks, Mr. Mallins made the following observations :—

> It is perfectly obvious that it matters very little whether the man appointed to the position of general manager of a tramway or railway undertaking is an engineer or not, so long as he is possessed of a sound commercial training, business acumen, is master of all the details of his undertaking, a good organiser, tactful with the public, and, above all, has practical experience in the general management of his department.

He admitted that there were cases of engineer managers turning out a success, but the general tenor was that it was a very inadvisable combination, and that tramway management was not their legitimate work. The inference, therefore, is, that the man responsible for managing an electrical undertaking is not called upon to possess the above qualifications which Mr. Mallins considers are only properly required by a tramway manager.

This view has previously been expressed, and it is about time that this entire misconception was put down once and for all. The manager of an electrical undertaking to-day has to possess all the above qualifications in a high degree, and the attempt to depict him as a long-haired scientist working out abstruse engineering problems for the greater part of his business hours, cannot be the opinion of any commonsense individual.

Mr. Mallins possibly forgets that a tramway manager is controlling what is practically a monopoly. Instead of this, the manager of an electrical undertaking has to fight the keenest competition combined with skilled business methods when dealing with his lighting and power supply. The call for good business and commercial training, together with tact in his dealings with the public, are obviously as great, if not greater, than that required in the case of the tramway manager. The proportion of his time devoted purely to business and commercial matters, which, in the majority of cases, are his principal duties, is again quite on a par with that devoted in the case of the tramway manager.

In the discussion on the subject, there was one point which was not referred to. Tramways are bound to lay aside large reserve funds, also many of the important undertakings are increasing their area and incurring further heavy capital

expenditure. How can it be asserted that the manager with no engineering knowledge is as well qualified to advise on the proper expenditure of these large sums as the man who is an engineer? The alternative is falling back on the platelayer, linesman, foreman, or the often poorly paid assistant who supervises these men. If the permanent way is under the local surveyor's control, however successful this arrangement is, his interests are hardly identical with those of the tramway manager, therefore the results cannot be so satisfactory. The old school will have to give way to the new school: this is fully exemplified in all recent tramway appointments, as almost invariably these have been filled by engineers.

An Engineer, and yet a Business Man.

Electric Cooking Apparatus.

I have read with interest Mr. Bennett's courteous criticism of my notes on the above, but I do not think that his deduction therefrom is quite fair, namely, that our interest in cooking apparatus leads more towards a condemnation of existing apparatus rather than towards efforts popularising their use.

A station engineer has to look at the matter from more than one point of view. No one is more anxious to popularise such appliances and to push their sale, but his first thought is naturally, Is this particular utensil going to give satisfaction and stand rough usage? Unless he can answer both questions in the affirmative he is chary of attempting to push the sale of it amongst his consumers, with the risk that not only will the particular article in question be condemned by the consumer, but, what is far more serious, that electrical cooking in general will be given a bad name. Once a consumer has become dissatisfied with any particular appliance of this sort, it is extremely difficult to make any kind of fresh start with him. I believe that if electric cooking is to become anything like general some sort of hiring scheme will be necessary. How many appliances are there on the market at present that could be hired out at a reasonable rate if that rate is to cover repairs and depreciation?

To return to Mr. Bennett's criticisms in detail: I am well aware that much better efficiency can be obtained by having a specially-designed utensil for each operation to be performed in the kitchen, such as grilling, boiling, baking, &c., but my notes were more particularly based on experiments carried out on utensils advertised and sold as being suitable for carrying out a number of operations on the one utensil.

The wealthy West End consumer will, no doubt, be quite agreeable to purchasing a dozen or so different utensils, each designed for the particular work it has to do, but if electrical cooking is to make any advance in the average suburban household, we must have some one appliance to take the place of the handy and convenient gas cooker.

Judging from his remarks, Mr. Bennett evidently thinks that the oven to which I referred is one of the cheap tin plate articles. I can assure him that it is a very solid affair made by one of our largest manufacturers, and its cost was not much less than £10. The oven top is not used as a boiling plate. For this purpose separate hot plates are fixed on the top of the oven, and it is these which have given so much dissatisfaction.

I am not satisfied with Mr. Bennett's arguments against the use of switches, except as regards small waterheaters and such like, and I feel sure that manufacturers, if they wish to, can easily get over any difficulties in the way of fixing same.

I also still consider that some form of heat regulation is essential on practically all utensils.

In conclusion, I would like to point out that my notes were not intended, in any way, as an exhaustive survey of all the cooking apparatus now on the market, but as a criticism of the design of certain appliances which have come into my hands. They are not utensils manufactured some years ago and therefore out of date, but they are utensils which have quite recently been put on the market, and might, therefore, quite reasonably be considered as the best that manufacturers can give us at the moment.

M. Farrer.

August 22nd, 1910.

Electricians' Employment Bureau.

My experience with a certain "Electricians' Union" has been similar to that of "A Subscriber."

Some seven months ago I became a subscriber to this Union, receiving a letter acknowledging my subscription, and informing me that the enrolment papers would be forwarded in due course. The "due course" lasted nearly a month, so I wrote to them, and had a reply saying that they could not trace my subscription, and would be glad to know the date when paid.

This information I gave them, receiving the enrolment papers 14 days afterwards, with a letter of apology.

Several weeks ago I sent in the enrolment papers filled up, also copies of testimonials, and have not, as yet, had any reply from them.

A friend of mine also became a subscriber, and, after waiting some weeks for the reply to his letter enclosing his subscription, wrote demanding the return of same, and had it returned, too.

A rather peculiar coincidence that two subscribers' letters from a small town should be "overlooked"! Now that the ice has been broken, perhaps there will be a bigger thaw.

I know what my answer will be when next year's subscription is demanded.

Beenhad.

I have read with interest and sympathy the letter from "A Subscriber" under the above heading. I myself joined one of these so-called employment agencies, and gave them full particulars of my training and qualifications, with testimonials. They were supposed to send me a list of vacancies monthly. It generally ended in my having to go for them myself. They did find a place once. It was to go round repairing automatic penny-in-the-slot machines, representing sports, &c.; and that after my serving an apprenticeship with one of the first electrical firms in the country, to say nothing of other qualifications. I expressed my opinion freely after I got back.

Bitten.

Proposed Association of Consulting Engineers.

In your remarks upon the word "civil" in your able leader, do you not somewhat lose sight of the main issue?

I do not think that it will be disputed by anyone at the present time that the expression "civil engineer" has assumed a special meaning quite different to that which it had at the time when the Institution of Civil Engineers was founded. And yet you suggest that those who support the proposed rules of the new Association should agree to the title "Association of Consulting Civil Engineers," whilst it is the avowed object of the promoters of the Association to include all branches of the profession.

In the case of the Institution of Civil Engineers, we are on very different ground. Unless you wish to force the view that the Institution should change a title of world-wide distinction because one of the words forming the same has acquired a restricted meaning, you must agree that it is somewhat unfair to saddle the Council of the Institution by assuming that they interpret their title according to this special meaning.

It has already been pointed out by Mr. Curry that there are a large proportion of engineers other than "civil"—I use the word in its modern sense, in spite of your severe treatment of another correspondent for doing the same—among the corporate members of the Institution; while the same correspondent has pointed out that their examination—the real bone of contention—offers equal facilities to all branches of the profession. Surely, then, it is somewhat unfair to argue that membership of the pioneer Institution should not be made a condition of joining the new Association simply because the title of the former contains a metamorphosed word. Yet this appears to be the opinion of several of your correspondents.

W. P. Johnson, A.M.I.C.E.

Referring to my letter under the above heading in your current issue and your remarks thereon, I regret that I wrongly suggested that you believed theoretical knowledge

to be essential for a "full blown" (and presumably competent) "consulting engineer."

With reference to your remarks regarding the word "civil," I cannot see where the difficulty arises. I repeat that in the expression the Institution of Civil Engineers (founded as far back as 1828), the word civil is used in its original and broadest sense, whereas by custom, the word is ordinarily used in its narrower sense, and in such narrower sense I *intentionally* used it in my previous letter, and use it again below.

I consider that the syllabus of the A.M.Inst.C.E. examination distinctly shows that the Institution encourages electrical and mechanical as much as civil engineers, which is contrary to the statements recently made in your columns. The object of my letter was to point out these misstatements rather than to criticise the various authors' views on what constitutes a competent consulting engineer.

Harold Curry, A.M.Inst.C.E., A.M.I.E.E.

August 20th, 1910.

[Mr. Curry appears to believe that "theoretical knowledge" is acquired or conferred by examination; for in his previous letter he certainly implied that, theoretical knowledge being essential to a competent consulting engineer, examination was indispensable, and he now affects to infer from our objection to an examination that we object to theoretical knowledge. An examination may prove the possession of "theoretical knowledge" without proving the possession of knowledge of theory, which is not necessarily the same thing; but that is by the way.

The real point of our argument is this: that the supporters of the clause under discussion insist on "having it both ways"—and that is impossible. They tell us that "Civil Engineers" embraces all kinds of engineers, and in the same breath they admit that the term designates a particular class of engineer. Which is it to be?

Our view is that the use of the term in 1828 has no bearing upon the matter to-day. Membership of the Institution of Civil Engineers *prima facie* stamps a man as a civil engineer (in the customary sense); it is largely for that reason that other engineering institutions have been founded for the benefit of those engineers who are not civil engineers, and we see no reason why such of the latter as are consulting engineers should be excluded from the proposed association unless they are willing to pose as civil engineers.

Mr. Johnson has missed the point of our suggested test; it was intended to illustrate the inconsistency of those who claim that the Institution of Civil Engineers is not an institution of civil engineers, but an institution of mechanical, electrical and civil engineers—an inconsistency which appears in his own letter.

We should like to point out that we level no complaint against the Council or members of the Institution of Civil Engineers as a whole; they do not come into the matter at all.—Eds. E.R.]

Query.—A correspondent asks for the names of makers of electric trolleys driven by accumulators.

The Engineering and Machinery Exhibition.—The Marquis of Graham, C.V.O., will formally open the Naval, Mercantile Marine, and General Engineering and Machinery Exhibition at Olympia, London, on September 1st. Special meetings of several engineering and scientific societies will be held at Olympia during the period of the Exhibition. The programme of events, as at present arranged, is as follows:—Tuesday, September 6th, Junior Institution of Engineers; Wednesday, September 14th, Institute of Metals; Thursday, September 15th, Institute of Sanitary Engineers; Saturday, September 17th, Institute of Marine Engineers; Wednesday, September 21st, Society of Engineers; Saturday, September 24th, Association of Engineers-in-Charge. The Exhibition will close on September 26th.

Canada.—A general idea of what is going on in Canada may perhaps be gained when it is noted that at least 7,000 miles of new railroads will be built during the next five years. In 1909 1,588 miles were constructed.

BUSINESS NOTES.

Woodeson Water-Tube Boilers.—Messrs. Clarke, Chapman & Co., Ltd., of Gateshead-on-Tyne, have recently received some large and important orders for these patent boilers, amongst them being the following:—

Large installation of boilers for extensions to the generating station at Devonport Dockyard, this being a repeat order for this type of boiler received from the Government during the last 12 months.
Two large boilers for Messrs. W. Sommerville & Sons for their paper works.
Four boilers for utilising the waste gases from coke ovens, for Messrs. Nunnery Colliery Co.
Four boilers for utilising waste heat from reheating furnaces, for Messrs. Wm. Cooke & Sons.
Four large boilers, for Messrs. Sir B. Samuelson & Sons, Middlesbrough, to work in connection with blast-furnace gases.
One boiler to utilise the waste heat from reheating furnaces for Messrs. Brown, Bayley & Co.
One large boiler, for Luton Corporation.
One boiler, for Whitehaven Colliery, this being the third repeat order for this company.

These, together with a large number of boilers booked during the previous few weeks for various parts of the country, are keeping the boiler yard well employed. In addition to the above, there are several large orders in hand for Continental and other foreign countries.

Book Notices.—"Reports for 1909 on The Geological Survey; The Geological Museum, in Jermyn Street; The Science Museum at South Kensington; and The Solar Physics Committee." 1910. London: Wyman & Sons. Price 9d.

"*Journal* of the Franklin Institute." Vol. CLXX, No. 2. August, 1910. Philadelphia: The Institute. Price 50 c.

"*Proceedings* of the Sydney University Engineering Society." Vol. XIV. 1909. Sydney: The Society.

"Electric Motors." By H. M. Hobart. London: Whittaker and Co. 1910. Price 18s. net.

"Glasgow and West of Scotland Technical College Calendar, 1910-11." Glasgow: The College. 1910.

The Faraday House Journal for August, which has just come to hand, contains an article by Mr. W. D'A. Madden on the "Commercial Production of Aluminium," and one by Mr. A. S. Cross on "Electrically-driven Winding Engines," with illustrations. The next term begins on September 26th. A large number of appointments gained by old Faradians is recorded in this issue.

"Regulations for Technical Schools, &c., in England and Wales." Part I.—Grant Regulations. 1910. London: Wyman & Sons. Price 2d.

"On the Difference of Potential due to the Vital Activity of Micro-organisms." By Prof. M. C. Potter. Excerpt from the *Proceedings* of the University of Durham Philosophical Society.

"*Journal* of the Western Society of Engineers." Vol. XV. No. 3. June, 1910. Chicago: The Society. Price 50 c.

"The American Institute of Architects Quarterly Bulletin." April, 1910. Vol. XI, No. 1. Washington, U.S.A.: The Institute.

"*Journal* of the American Society of Mechanical Engineers." August, 1910. Baltimore: The Society. Price $1.

"*Bulletin* of the Imperial Institute." Vol. VIII, No. 2. 1910. London: Eyre & Spottiswoode.

"The Physical Review." August, 1910. Vol. XXXI, No. 2. Lancaster, Pa.: The *Review* Offices.

Bankruptcy Proceedings.—Frederick Peacock, electrician, 59, North Station Road, Colchester.—A receiving order was made at Colchester, on August 17th, on debtor's own petition. First meeting and public examination, September 9th, at Colchester.

Thomas L. Callender, electrical engineer, lately trading as the Shamrock Cycle Co., Nottingham.—September 3rd is the last day for the receipt of proofs for intended dividend by the trustee, Mr. E. Wynne Humphreys, 4, Castle Place, Nottingham.

Geo. Kaye Spivey, electrical engineer, Wakefield.—This debtor applied to Judge Greenhow at the August sitting of the Wakefield County Court, for his discharge from bankruptcy. The report of the Official Receiver showed that debtor failed in December, 1907, his liabilities being £117 and the assets £5 2s. He started business in 1899, and had two partners, both of whom were paid out. By a fire he lost £1,200, and only received £455 from the insurance company. The discharge was suspended for two years.

Frank Sheppard, electrician, Haslett Road, Kensington, W.—This debtor attended last week before Mr. Registrar Hope at the London Bankruptcy Court for public examination upon accounts showing liabilities £918, and assets of no practical value. In reply to Mr. Walter Boyle, Assistant Official Receiver, the debtor stated that in 1904 he set up in business at 122, Merton Road, Wandsworth, as a dealer in electrical accessories and motor-car appliances; the trading was not successful, and was only kept on by means of borrowed money. In January, 1907, witness inherited under the will of a relative a sum of about £3,500; he invested £2,000 in the Miesse Petrol Car Syndicate, Ltd., of which company he was appointed managing director; he further advanced loans to the company from time to time, amounting in all to £500; and in June, 1908, he obtained a compulsory winding-up order against the company. A further sum of £500 was lost by speculation on the Stock Exchange. In April, 1909, witness's wife purchased an electrical business, which he had managed on her behalf. He

attributed his failure and insolvency to losses sustained in connection with the Miesse Petrol Car Syndicate, Ltd.; on March 4th last judgment was obtained against him in respect of a liability incurred on behalf of the company, and being unable to satisfy the judgment, he was made bankrupt. The examination was concluded.

The National Lighting Corporation, Ltd., 35, Cock Lane, E.C.—A compulsory winding-up order having been made against this company, the statutory first meetings of the creditors and shareholders were held on Tuesday at the Carey Street offices of the Board of Trade, Lincoln's Inn Fields, W.C., Mr. W. J. Warley, Official Receiver, presiding. The accounts filed under the liquidation show liabilities £512, against assets valued at £144, but with regard to contributories a deficiency of £1,378. According to the Official Receiver's report the company was registered on August 30th, 1909, with a nominal capital of £1,000, divided into shares of £1 each, but which is stated to have been increased by special resolution to £1,100 by the creation of 2,000 shares of 1s. each. The promoters of, and vendors to, the company were Messrs. Samuel Mundler, Alfred Lange and Isidore Frohwein, who were also the first directors of the company. In June, 1909, Messrs. Lange and Frohwein were carrying on business as dealers in electrical toys, under the style of Fiebig & Frohwein, and in or about the same month an arrangement was entered into between the firm and Mr. Mundler for the introduction of a new branch of business relating to electric lamps. This branch of business was carried on under the style of the National Lighting Corporation, and was distinct from the other business of Messrs. Fiebig & Frohwein. Under the arrangement referred to, Messrs. Lange & Frohwein were to take one-half the profits and Mr. Mundler the other half. The company was formed to acquire the business of the National Lighting Corporation. No written contract with regard to the transfer of the business to the company was entered into, but an oral agreement was made about which there was a dispute. In January, 1910, Mr. Lange commenced an action against the company and Mr. Mundler, and it was ordered that all matters in dispute should be referred to arbitration. The arbitrator awarded that Mr. Lange was entitled to recover against the company a sum of £437 in respect of goods supplied. Mr. Lange subsequently obtained relief from penalties for the omission to file the necessary particulars of the oral contract, and such particulars have since been filed. The cause of the company's failure is attributed by Mr. Mundler to the proceedings taken by Mr. Lange, and the judgment obtained by him against the company. The claims of the unsecured creditors, £512, include the sum of £437 awarded to Mr. Lange, the remainder being principally in respect of advertising and goods supplied. In the absence of a quorum, the meetings were formally adjourned.

Trade Announcements.—Messrs. Arthur Jopling and Co. have opened at 16, Park Place, Leeds, a branch office and stores, to deal with their business in the North of England. They will carry stock including wires and cables, switches, holders, fuseboards, &c., also their patent enclosed flame arc lamp, and enclosed arc lamps and open-type flame arc lamps. Mr. A. A. Pyman has been appointed manager for the Leeds district.

The address of the Decimal Association has been changed to 19-22, Finsbury Court, Finsbury Pavement, E.C.

Messrs. David Shanks & Co., Ltd., electrical fittings manufacturers, have removed from Manor Works to larger premises at 115, Wainwright Street, Aston, Birmingham.

Messrs. Daffern & Edwards have taken over the business of Messrs. E. C. Woollard, Ltd., electricians, &c., of 10, High Torr, Hereford.

Catalogues and Lists.—Messrs. Clarke, Chapman and Co., Ltd., Queen Anne's Chambers, Broadway, Westminster.—New pamphlet, No. 7 (28 pages), containing a good deal of general information regarding the Woodeson patent water-tube boilers, including particulars of tests of such boilers in electric generating stations, also copies of a number of testimonials. Copies of the pamphlet can be obtained at the above address.

The Shelby Manufacturing Co., Rye Works, Peckham, S.E.—Illustrated leaflets giving particulars and prices of their oil filters and purifiers, and improved exhaust steam head.

Messrs. Donovan & Co., Barwick Street, Birmingham.—Two illustrated price lists, one dealing with the Barwick switchgear (accumulator switchboards, knife switches, enclosed switches in cast-iron cases, fuses and fuseboards); the other particularising a number of lampholders, switches, wall plugs and other electric lighting accessories.

Messrs. L. E. Wilson & Co., 20, Cross Street, Manchester.—New catalogue giving particulars, illustrations and prices of the "Thomson" electric lamps—torch, pocket, police and cycle types, and instructions for recharging.

Messrs. Ward & Goldstone, Springfield Lane, Salford.—A number of new pamphlets have just been issued as follows: One relating to, and showing, the "Guardian" safety portable hand lamp, Board of Trade pattern, also "Handshield" plugs, and "Guardian" pendant lampholders; a second gives prices, &c., of their "British Metallum" (colloid-tungsten) lamps; a third is a leaflet concerning "Brillia" incandescent lamps and "Ideal" turn-down lamps; while another is devoted to a number of outside fittings for metallic-filament lamps and "Beatark" fittings.

Wardle Engineering Co., Ltd., 196, Deansgate, Manchester.—Illustrated pamphlet, entitled "Streetlites, &c.," dealing with a variety of street lighting and other fittings for tungsten lamps.

General Electric Co., Ltd., Queen Victoria Street, E.C.—Booklet No. E 1,414, describing, pricing and illustrating the "Butt arc lamp, for direct or alternating current.

Worthington Pump Co., Ltd., 153, Queen Victoria Street, London, E.C.—Very finely illustrated catalogue (No. 10) of 100 pages, giving a great deal of well arranged matter, with excellent half-tones, of boiler feed, ram feed, vertical donkey feed, compound steam, low service, piston pattern and much other Worthington pumping machinery. The tabular information gives sizes of pumps, floor space required, sizes of pipes, code words, and so forth. Copies will be sent to anyone interested on written application to the company.

Bruce Peebles & Co., Ltd., Edinburgh.—Pamphlet No. 23, giving full particulars and drawings of the Peebles Clyde patent capstans, for which economies in energy consumption and wear and tear are claimed.

Clarke & Co., Ltd., Central Chambers, 17A, South Castle Street, Liverpool.—Circular describing and illustrating the Barry and Clarke temperature indicator and recorder, for use particularly in connection with cold stores and refrigerating plants on board ship.

The Armorduct Manufacturing Co., Ltd., Farringdon Avenue, London, E.C.—New list (No. H 1,036) of eight pages, containing particulars, with many illustrations and prices, of "Therma" electric heating and cooking apparatus. A number of kettles, hot-water jugs, coffee machines, egg boilers, hot plates, saucepans, cookers, cigar lighters, heating pads, irons, foot warmers, tramway heaters and convectors are neatly shown, and prices are clearly set out. The makers state that, in order to demonstrate the durability of the "Therma" system, several ordinary stock-pattern irons were recently placed under current continuously for several months, and after severe test were found perfectly intact.

Maschinenfabrik Augsberg-Nurnberg A.G., Caxton House, Westminster.—Illustrated leaflet drawing attention to their Nuremberg marine oil engines, which are built in all sizes from 150 H.P. upwards.

The Western Electric Co., Ltd., North Woolwich.—A strongly and neatly bound catalogue consisting of some 270 odd pages of illustrations and matter relating to the firm's telephone apparatus and supplies has just been issued. A convenient 24-page list of prices of the various apparatus, is fastened in the front of the book. Full code word and alphabetical indices lead the way to the descriptions of a great variety apparatus, all the latest instruments being shown, including those for the central battery system introduced, and perfected by the Western Electric Co. Further reference to the contents of the book appears in our "New Devices" section to-day. We are asked to state that copies of the catalogue will be forwarded to firms in the electrical trade who are directly interested in the sale and installation of telephones, on application.

American Electrical Exports.—The New York *Electrical World* states that for the year ending June 30th there was a steady and marked gain in the export of miscellaneous instruments and apparatus, and a falling off in heavy electrical machinery. "This differentiation was maintained in June, and there seems to have been no cure found for it yet. The export of smaller stuff during June was $902,593, as compared with $595,044 in June, 1909; while the export of heavy machinery was $586,202, as compared with $687,453. The gain in the one instance, and the decline in the other, is certainly sharply marked. Taking the total figures for the year we find that the export of instruments and apparatus reached $8,694,132, against only $6,074,865 in 1909, a gain of $2,619,267. On the other hand, the total for heavy electrical machinery was $6,048,263, against $6,449,526, a loss of $401,263. It follows that the net gain for the year on the whole electrical export trade was $2,211,004, which is comforting and encouraging to say the least. The total for 1910 was $14,742,395, as compared with $12,524,391 in 1909. But 1910 was still somewhat behind 1908, when a total was reached of $15,159,436. That year the importance of the two items was almost exactly reversed from 1910, and heavy machinery then amounted to $8,405,219." Our contemporary adds: "The trade of the year shows British North America to have continued an excellent customer and our best, but Brazil and Mexico come to us with a large demand, while the Japanese trade has shrunk. The United Kingdom seems to be buying again, but is far behind its old figures; and France and Germany are not the customers they were formerly. Evidently we need to vary our exported product, seek the general markets not supplied by their own manufacturers, and take new hope from the new data."

Electrical Enterprise in Turkey.—A certain amount of interest will be manifested in the report of the combination formed by German, French and Swiss capitalists just over a year ago under the title of the Union Ottomane, Société pour Entreprises Electriques en Orient, for the promotion of electrical enterprise in Turkey. The report states that the financial year which ended on June 30th was one of preparation, the opening of relations and the initiation of the forms of business stipulated by the statutes. The company was created in order that the joint endeavours of high finance and of industry in the most advanced countries on the European Continent might be combined, so as to be able to contribute towards the monetary and industrial development of the Turkish Empire, in connection with which the high finance and the industry in these European countries should be assured a place in the formation of undertakings in Turkey. As the principal scope of activity during the year, the report mentions the reorganisation of the Constantinople Tramways, in which the company has acquired £153,000 in ordinary shares and £21,000 in preference shares. The tramway concession was prolonged in 1906 to the year 1993, and the Union Ottomane hopes definitely to receive the order for the conversion of the lines to electric traction.

As far as the telephone concession in Constantinople is concerned,

the report states that the company, with the support of the Deutsche Telephonwerke, participated in the competition. The specification contained a number of conditions which the Union Ottomane considered as unacceptable and not consistent with the interests of the city, and the company therefore submitted a counter scheme to the Minister of Public Works which would have better met the interests of all concerned. These efforts, however, were unsuccessful. The company also took part, in conjunction with the leading German and French electrical firms, in the competition for the establishment of lighting and power works in Constantinople, and a decision is expected to be arrived at by the Minister of Public Works by the middle of December at the latest. The hope is expressed by the company that its efforts will be crowned with success, especially as the scheme provides for the town participating largely in the profits from the beginning.

Apart from the operations mentioned, the Union Ottomane had various other undertakings under consideration during the year, some of which proved to be impracticable and some of lesser importance, whilst others were in such a position as to exclude detailed statements. As showing what the company is prepared to do in another direction, the report states that, through the mediation of the Deutsche Bank, the Union Ottomane placed its liquid resources at the disposal of the Turkish Government as an advance for several months for the construction of a new bridge (the Karakeny Bridge) over the Golden Horn. The amount of the advance had been repaid as soon as a special loan was raised to provide the funds for the building of the bridge.

Holidays.—Messrs. Ferranti, Ltd., Hollinwood, announce that their works and offices will be closed from Friday evening, August 26th, until Monday morning, September 5th, for the annual district holidays.

Porcelain Insulators for New Zealand.—H.M. Trade Commissioner for New Zealand (Mr. G. H. F. Rolleston) reports that a firm at Wellington wish to get into communication with British manufacturers of porcelain insulators. Communications in this connection, together with catalogues and price lists with discounts, should be addressed to H.M. Trade Commissioner, 9, Grey Street, Wellington, New Zealand.—*Board of Trade Journal.*

Telescopic Scaffold.

Telescopic Scaffold.—We illustrate a portable telescopic scaffold ladder recently shipped by Messrs. Heathman & Co., Parson's Green, London, S.W., to Johannesburg. The platform upon which the workman stands adjusts at any height from 9 ft. to 18 ft., and is surmounted with a guard rail and tool tray; the lower section was dismounted and packed for transport, at reasonable cost. The woodwork was of Oregon pine, with steel forgings and rubbered tired wheels.

Brussels Exhibition.—The Reflector Syndicate, Ltd., which operates the Cowper-Coles patents for the production of gold and metallic mirrors for searchlights, &c., has been awarded, under the various sections of this Exhibition, one Grand Prix, four gold medals, and two silver medals. We understand that the gold mirrors are now being extensively used for motor-car headlights.

British Export Trade to India: Proposed Mutual Exhibition at Calcutta.—We have had placed before us a few particulars regarding a "British Manufacturers' Mutual Export Development Scheme for the East." The title is of interest in view of recent statements by commercial authorities that our manufacturers could do far better business if they were to act co-operatively or in combination in seeking to further their trade connections with certain foreign countries. The remarks of Sir Adam Block, in which he referred to the necessity for such action in respect to Turkey, and to which we alluded at length several months ago, will be well within the recollection of our readers. The present scheme is for the erection and equipment of a permanent exhibition in Calcutta, for the exhibition of articles of British manufacture only. We are informed that the justification for this scheme is found in the increasing demand for articles of various kinds which are now imported into the country, as the statistics show. Under the existing conditions, as demand increases, so in proportion are other countries benefited to the detriment of Great Britain, owing to the fact that middlemen practically control the trade in the East. To them the temptation to recommend goods of foreign manufacture, instead of those of British, is very great, owing to the large discounts and encouragement they receive in the former case, as against the comparatively small ones in the latter. In spite of the fact that it is recognised that the middleman's profits are reaped at the expense of the quality of the goods, yet so strong is his position, that unless British manufacturers in some form combine to combat the present condition of affairs, he will continue to stifle both the worth and the sales of articles of British manufacture. On all sides it is admitted that a permanent exhibition would be of enormous advantage, not only in this country, but to the community of India. The movement would be governed by a council resident in this country, who would be guided by a committee of manufacturers. There would be an office in London where the fullest information would always be obtainable on all matters connected with the Anglo-Eastern trade, while in Calcutta, at the exhibition, samples, prices, &c., would always be ready and duly advertised. The success of the undertaking will depend entirely on the support it receives from manufacturers in this country, and it is therefore necessary to obtain an undertaking from a certain number of them that they will join in the movement in, at all events, its initial stage. British electrical manufacturers who are in the least interested in the matter are invited to communicate with Mr. Frank W. Hart, of 30, Whitehall Gardens, Acton, London, W., who, we understand, has seen very long service in India in connection with different departments of trade, including the electrical. He will forward, on request, the details necessary to enable a practical consideration of the scheme to be made by individual heads of firms.

Palacio de Monserrato, Cintra, Portugal.—This famous palace, whose gardens are said to be among the most beautiful in the world, is about to be fitted with a complete electric light installation, including generating plant. The contract, which is to be carried out in accordance with the best British practice, with British material and by British workmen, has been secured by Messrs. Belshaw & Co., of 53, Victoria Street, London, S.W., who successfully tendered in competition to the specification drawn up by Mr. S. G. Castle Russell, M.I.E.E., the consulting engineer. The palace is the property of Sir Frederick Cook, Bart., of Doughty House, Richmond, who, as the Vicomte de Montserrate, is an important member of the Portuguese nobility.

Dissolutions and Liquidations.—Oldbury Steel Conduits, Ltd.—A meeting is to be held at Oldbury on October 3rd to hear a report on the winding up from the liquidator, Mr. J. Sutton.

The Telewriter Syndicate, Ltd.—The company's assets having been sold to the National Telewriter Co., Ltd., is winding up voluntarily, with Sir John Craggs as liquidator. A meeting of creditors is called for August 24th at 3, London Wall Buildings, E.C.

British Tungsten Lamp Co., Ltd., Huyton Quarry, near Liverpool.—On August 8th, Mr. H. Lonsdale was appointed receiver on behalf of the holders of second debentures in the company pending the completion of certain arrangements whereby the reconstruction will be effected. In the meantime, all orders for goods issued by him will be paid for upon receipt of invoice. Mr. Lonsdale states that it is fully anticipated that as soon as possible after the necessary arrangements are completed, all creditors will be paid in full.

The Accessories Manufacturing Co., Ltd., 11, Dean Street, London, W.—This company is in voluntary liquidation. Creditors should furnish particulars of their claims to the liquidator, Mr. H. A. McCann (Messrs. H. B. Brandon & Co., 36, King Street, E.C.). A meeting of creditors is called for September 2nd.

South Africa.—An American Consul, after dwelling upon the large and increasing demand in every part of South Africa for all kinds of mining and electrical machinery, and to the part that German finance has played in assisting the German electrical manufacturer to do a greatly increased power station equipment business there of late, proceeds to caution manufacturers against giving agencies covering the whole of South Africa, or even Cape Colony, to the large and responsible importing firms at Cape Town, Port Elizabeth, and East London through whom all foreign business is done in that country, unless they first ascertain whether these firms are equipped to cover the territory allotted them, and this can only be accomplished properly by sending a competent representative to the country. "The merchants at the coast ports have a large number of agencies and stock hundreds of different articles, and although they are well organised and strong financially, and have travellers who periodically visit retail stores in the interior, they cannot pay the necessary attention to any particular article. Therefore it is necessary for manufacturers, besides sending first-class representatives at the outset to make selling connections, to have them return every year or two to visit the merchants' customers—not, of course, to sell goods, but to show the merchant how to create a demand for them."

Church Lighting.—The District Electric Co., Ltd., of Wolverhampton and Birmingham, have recently installed the electric light in St. Stephen's Church, Willenhall.

Chimney Shaft Repairs.—The Steeplejack and Engineering Co., of Castle Boulevard, Nottingham, have received instructions from the City of London Electric Lighting Co. to carry out extensive repairs to their two chimney shafts at Bankside, S.E.

LIGHTING and POWER NOTES.

Acton.—The deputation appointed by the Council to wait upon the Metropolitan Electric Supply Co., Ltd., to ascertain the best terms upon which the latter would take over the electricity undertaking, is said to have gone about its work without the guidance of either the clerk or the electrical engineer, and, so far, no report of the result has been made known. Councillor H. S. Schultess-Young, chairman of the Council, has, however, addressed a letter to the clerk, stating that "in view of the possibility of our not coming to terms with the Metropolitan Electric Supply Co., Ltd., I suggest it might be advisable for the electrical engineer to obtain what definite information he can as to the approximate cost of a generating station." This will be considered at the Council's next meeting.

Australia.—The Inverell (N.S.W.) Municipal Council has decided to install an electric plant for lighting the municipality, at an estimated cost of £8,700. Mr. J. E. Donoghue, electrical engineer of the Electric Light and Power Corporation, Ltd., Balmain, has been authorised to prepare plans and specifications for the scheme. —*Australian Mining and Engineering Review.*

Aldershot.—The U.D.C. has received from the L.G.B. sanction to loans of £770 for excess expenditure, and for a mechanical stoker, &c, ; £1,200 for mains ; and £330 for services.

Argentine.—A company has been formed in Buenos Ayres to take up the concession granted to Mr. A. Lemousin for an electric light and power house in the city of La Plata. The new company will have rather uphill work to compete against the River Plate Electricity Co., which has worked in La Plata for many years.

Barnes.—The U.D.C. has, by 6 votes to 3, referred back to the Committee a recommendation to support the proposed Bill of the I.M.E.A. seeking wiring powers, &c., and to contribute up to £50 towards the expenses. Opposition was based on the ground that the powers sought would enable the Council to compete with local tradesmen doing electrical work.

Barnstaple.—The Electric Lighting Committee recommends that application be made to the L.G.B. for power to borrow £1,080 expended on capital account to March 31st, 1910, and £892 for further expenditure, making a total of £1,970. Mr. Bassett, moving the adoption of the report, said the last loan of £4,000 was sanctioned in 1906, the whole of the work contemplated being carried out with the exception of the extension in Litchdon Street, and the completion of the work at Runsom. The present overdraft of £1,079 was made up, as would be seen from the published accounts, principally on mains, meters, and general stores. It was estimated that in the next five years there would be 100 new consumers, the new services costing £250, meters £146, and cables £308. The report was adopted.

Brazil.—The London office of the Rio de Janeiro Tramways Light and Power Co. announces that 2,000 arc lamps for lighting the streets of that city have been put into operation under the new contract with the municipality.

Cobham.—The Woking Electricity Co. has decided to extend its supply to Cobham, which, owing to a dispute with the local gas company, recently resorted to oil lighting for the streets. It is expected that electricity will supersede oil by the end of the year.

Continental Notes.—Sweden.—It is announced from Stockholm that the beautiful waterfalls near Aelfkarleo are now to be utilised for industrial purposes, and the preliminary arrangements have already been concluded. It is proposed, in the first place, to install plant for the supply of 5,000 H.P. in the town of Gefle, which is 16 miles distant, and the power station is to be able to furnish power cheaper than the existing electricity works in Gefle. It is also hoped to secure customers for the station in Upsala, which is 55 miles from Aelfkarleo, and in other industrial places in the provinces of Upland and Gestrikland. A Government Bill on the subject is expected to be placed before Parliament in the next session, and, subject to the sanction of the legislature, the commencement of the constructive works is to take place next summer.

Italy.—It is proposed by the Italian Soc. di Elettrochimica, of Rome, to install a generating plant on the River Pescara, consisting of four three-phase 9,000-H.P. generators for supplying 42-cycle current at 6,000 volts. Seven single-phase transformers of 3,600 K.V.A. each, for stepping up the pressure to 50,000 volts, will be installed, and energy will be transmitted over 200 km. to Naples for local use.

Spain.—The Belgian Consul at Granada points out in a recent report that, owing to the availability of abundant water power, electrical energy is extensively used in the Province of Granada, mainly for lighting purposes. There are three large power stations in the town of Granada, and about a dozen smaller stations in the province. The Consul adds that plans are being drawn up for the utilisation of other large waterfalls in the Sierra Nevada, with the object of supplying electrical energy to the neighbouring provinces. —*Board of Trade Journal.*

Darlington.—A L.G.B. inquiry was held last week into the application of the T.C. for a loan of £1,500 for the extension of the condensing plant. There was no opposition.

Dartford.—The U.D.C. has decided to apply to the L.G.B. for a loan of £10,000 for the extension of the electricity works and additional plant, and £1,000 for feeders and distributors. It is proposed to engage a consulting engineer to advise the Council on the power portion of the additional plant.

Dublin.—We understand that O'Connell Bridge, Dublin, is now most effectively lighted by means of 39 100-volt 55-watt Osram lamps, these being fitted in the old lanterns which were originally put up by the gas company. The lamps are stated to have proved themselves fully capable of withstanding the rough weather that they are naturally exposed to in such a position.

Liverpool.—The Otterspool lightship which has been used for guiding mariners along the Garston Channel is to be removed and the station abolished, the Dock Board having decided to provide as a substitute an electrically controlled fog-bell on the Dingle Point at an estimated cost of £286.

Maidstone.—By 10 votes to 5 the T.C. has decided to support, and to contribute up to £25 towards the cost of the promotion of the Bill of the I.M.E.A. seeking wiring powers, &c. When the matter came before the Council on August 17th, it was stated that the I.M.E.A. had received 50 promises of support and and only 5 refusals, the 5 dissentient concerns opposed on the ground that it was unjust for a municipal body to use the ratepayers' money in order to take away the ratepayers' own trade. It will be remembered that the Maidstone T.C. some time ago proposed to promote a similar Bill, but abandoned the idea.

Manchester.—Correspondence has passed between the secretary of the Manchester Ratepayers' Association and the Local Government Board with respect to the application of the Manchester Electricity Committee for sanction to borrow £40,000. He asked if the L.G.B. had dispensed with an inquiry on the matter before granting the sanction, and the assistant secretary to the L.G.B. replied that loans amounting to £40,000 had been sanctioned by the Board of Works in connection with the Manchester electric lighting undertaking on June 2nd, as the Board did not consider it necessary to hold a public inquiry before sanctioning the loans. Mr. Percival wrote again, and said the Association would be glad to have the authority upon which the Board relied, in taking such a view, as the Association felt very strongly the necessity for maintaining the control of the ratepayers over the expenditure of the various Committees of the Corporation, and seriously deprecated any change of procedure in the sanction of loans calculated to weaken that control, or in any way to relieve the financial and other questions of any Committee from the field of local criticism.

Middlesbrough. — Some important extensions have recently taken place at the exhaust steam generating station installed at Messrs. Samuelson's Ironworks at Newport, Middlesbrough. This station, which belongs to the Waste Heat and Gas Electrical Generating Stations, Ltd., utilises the exhaust steam from blast furnace blowing engines, and the electrical power produced is partly used on the spot and partly supplied to the network of the Cleveland and Durham Electric Power Co. The new plant consists of two 1,250-KW., three-phase, 40-period, 6,000/6,600-volt turbo-alternator sets, of Westinghouse make, running at 2,400 R.P.M. The turbines are of the double-flow reaction type, in which the steam is expanded from atmospheric pressure to condenser pressure. The centrifugal governor is driven direct through a worm-wheel and shaft from the turbine spindle, and controls direct the valve admitting steam to the turbine. Two safety devices are supplied for shutting off the turbine in case the speed becomes excessive. One opens up the condenser to the atmosphere and destroys the vacuum while the other closes the governor valves. The condensers are beneath the turbines, and the air-pumps are of the Westinghouse-Leblanc type, sealed with water, the pump itself being driven by a squirrel-cage motor direct connected with the air-pump shaft. The condensed water is returned to the works. The hot water lift pump is also driven by a squirrel-cage induction motor. The electric generators are the two-pole, revolving laminated field type, giving a continuous output of 1,875 K.V.A., the normal rating being 1,565 K.V.A.

Preesall (Lancs.).—The Lighting Committee of the U.D.C. has decided that the secretary to the Urban District Councils' Association be requested to take the necessary steps for obtaining a prov. order for electric lighting in the district.

A Scottish Contractor's Plant.—All the machinery required on the important Loch Arklet contract is driven by electrical power. The contract, which is in the hands of Messrs. Charles Brand & Co., is for the converting of that loch, and an area of ground round about, into a water reservoir in connection with Loch Katrine for the Glasgow water supply. The power house is on the Loch Lomond side. Pipes convey water from the small river known as the Arklet Water to the power house, where two Pelton wheels of 135 B.H.P. each, drive two compound-wound generators of 80 KW. each. The effective hydraulic head is 300 ft. Cables convey the power to the works at the dam and the tunnel, the latter being distant six miles. An aerial ropeway is also worked by electric power, a motor of 55 B.H.P. being installed for this purpose. This aerial ropeway is 1½ miles in length, and is constructed on the Bleichert system, carrying 50 tons per hour in single loads of 2 tons each. Rock boring is done by air drills driven by compressed air at a pressure of 80 lb. per sq. in., and the compressors, which are situated at the dam and at the tunnel, are operated by 40-H.P. electric motors. There are also two electrically-driven gyratory stone crushers ; and a large concrete mixer capable of turning out 30 cb. yd. of concrete per hour is worked by electricity. All the cranes, varying in lifting power from 3 to 5 tons, are electrically driven. The pumps also, and various labour-saving appliances in use over the contract, are worked by electricity.

The first cost of the installation has been somewhat heavy. In order to secure an ample supply of water for the power house pipes during the dry seasons, the contractors had to build a dam across the outlet from Loch Arklet into the little river ; and the distance from the power house on Loch Lomond to the far end of Loch Arklet, where the aqueduct tunnel is being constructed to connect with Loch Katrine, involved considerable outlay in cables. But on the other hand, the contractors have an ample supply of power for every description of machinery, and expect at the conclusion of the contract to have benefited financially by having been able to dispense with all steam-driven plant, with the consequent saving in working costs, apart from the time saved by the free use of electrically-operated appliances.

South Africa.—Cape Town.—With a view to advertising the advantages of electrical energy for domestic purposes, as well as for illumination, the City Council propose to inaugurate an electrical exhibition at the City Hall. The various electrical supply firms in the city will also participate in the exhibition, which will be held about Christmas time.

Southend-on-Sea.—The T.C., whilst favouring the proposed Bill of the I.M.E.A. to secure wiring powers for local authorities, has declined to contribute towards the cost.

Stirling.—The Scottish Central Power Co. has entered into an agreement for the electrical driving of the Caledonian Carpet Co.'s mills, at Stirling, energy being obtained by overhead wires from the Power Co.'s station at Bonnybridge. The Stirling Corporation also tendered for the supply.

Waterfoot.—A special sub-committee of the Rawtenstall Corporation has gone into the question of the electric lighting at the new Market Hall, and decided that the borough electrical engineer prepare plans and specifications for the inside and outside lighting of the Market Hall on the lines specified, and that tenders for the work be invited from firms mentioned.

Ystradgynlais.—The District Council has decided to engage a consulting electrical engineer for a year, to assist the Council in safeguarding their interests in connection with the electric light scheme being carried out.

TRAMWAY and RAILWAY NOTES.

Bacup.—The T.C. has issued notices of its intention to proceed with the construction of a line of tramway in Bridge Street, St. James's Street, and Rochdale Road.

Continental Notes.—Switzerland.—A mountain electric railway has just been completed by the Alioth Co., and opened for traffic between St. Moritz, and up the Bernina Pass to Tirano, the latter being 7,642 ft. above sea level.

On Saturday next, August 27th, the new line of electric railway connecting Orsières with the Swiss Federal Rail-way at Martigny, will be opened with fitting ceremony at Martigny. The line, which passes through and near magnificent scenery, and many places of historic interest, will possibly become of considerable national importance later on, forming, as it may, the first section of a suggusted new highway between Switzerland and Italy. We understand that several Italians holding high positions politically, are expected to be present at the inauguration of the railway, the capital for which has been provided entirely in this country. Our readers are aware that at Orsières, the British Aluminium Co., Ltd., is interested in the utilisation of water power in connection with its operations. The length of the line is 19·3 km., or about 11¾ miles. It is a normal gauge railway with 80-lb. rails laid on impregnated beech or oak sleepers, and runs throughout on a special track. The minimum radius of the curves is 180 metres, or 197 yards, and the maximum gradient 1 in 28·6. A good deal of blasting and tunnelling has had to be done, particularly in the Gorge of la Drance, where the line traverses two bridges, four balconies supported on the mountain side and three tunnels, while in the neighbourhood of Sembrancher there are three bridges, two balconies and four tunnels. Electric traction is by single-phase alternating current, at a pressure of 8,000 volts and 15 cycles per second. The trolley line consists of a single copper wire of 8 mm. diameter (·31 in.), simple suspension being employed in the open with catenary suspension in the stations. The weight of the passenger motor-cars is 45 tons, and they are fitted with four motors of the Brown-Boveri type, rated at 80 H.P. The cars are fitted with three brakes: hand, electric and compressed air. The speed on the level is 40 km. per hour, or 25 M.P.H., and on a gradient of 1 in 28·6, 30 km. per hour, or about 19 M.P.H. Work was commenced on the line on August 1st, 1907.

Germany.—According to the *Financial News*, at the last general meeting of the Berliner Strassenbahn (General Berlin Tramway Co.) the general manager of the A.E.G. (Herr Rathenau) was appointed a member of the board of directors. That gentleman seems to have been elected with a view to putting an end to the quarrel between the municipality and the company, seeing that he is chairman of the Berliner Electricitäts-Wirke, which supplies the power to the Strassenbahn. The latter company is to be taken over by the municipality.

Austria-Hungary.—The municipal authorities of Kecskemet (Hungary) have arranged to contract a loan of £62,500 for the purpose of constructing an electric tramway.

Derwent Valley.—The Light Railway Commissioners have submitted to the B. of T. for confirmation an Order for reviving the powers granted by the Derwent Valley Light Railways Orders, 1902 and 1907, and extending the periods for the completion of the work.

Dundee.—From the ninth annual report of the City Tramways, just published, it appears that on last year's working the gross receipts amounted to £62,328, and the working expenses to £40,164. A contribution of £1,000 has been made to the common good. During the year 16,988,331 passengers were carried. By way of experiment two cars are being fitted with vestibule ends, and all the cars are now provided with top covers.

Dunfermline.—The promoters of the Dunfermline and District tramways are to proceed immediately with the extension of their system from the north end of Cowdenbeath to Kelty. The laying of the lines from the High Street in Dunfermline to the west end of the burgh is not likely to be commenced till next year.

Huddersfield.—At the meeting of the T.C. on the 17th inst., Alderman Aston (chairman of the Tramways Committee) proposed that the salary of the manager, Mr. R. H. Wilkinson, be increased from £375 to £400. The resolution was carried. It was suggested that a limited number of cars be run on Sunday mornings, and the chairman said the matter had not been considered by the Committee. The borough engineer's estimate of the cost of the reconstruction of the Linthwaite track was £26,829, in addition to £4,000 which had to be paid to the Linthwaite U.D.C., and other charges which brought up the total to £30,855.

Keighley.—The Tramways Committee of the T.C. has recommended that the question of applying for powers to construct additional tramways be deferred with a view of Parliamentary powers being obtained, at a later stage, to construct and run trackless trolley cars on certain routes.

Liverpool—Southport.—It is stated that it is the intention of the L. & Y. Railway Co., in view of the success which has attended the electrification of the line from Aintree to Maghule, to further extend the electric system as far as Ormskirk. It is also understood that the company intends to inaugurate a scheme to embrace an electric belt between Liverpool, Ormskirk and Southport, linking up a triangular section of the line electrically.

Llandudno.—An extension of time until September 30th, 1911, has been applied for, to the B. of T., by the Llandudno and Colwyn Bay Electric Railway, Ltd., for the completion of the lines to Deganwy, and from the terminus in Conway Road to Abergele Road, Colwyn Bay.

Oldham.—On the 18th inst. the Corporation's new tramway depôt in Hollinwood was opened by the Mayor (Alderman Schofield). The cost of the structure and land is £22,760, and there is accommodation for 60 cars. Alderman Dunkerley, chairman of the Tramways Committee, said the tramways were the best paying of the Corporation's undertakings. The tramway receipts rose from £65,000 in 1905, to £100,000 last year.

Perth.—The Corporation Tramways Committee has decided to award bonuses to tramway workmen for general efficiency. The grants, which will be divisible between driver and conductor, will be £6, £4 and £2.

The extension of the Corporation tramway line at Craigie will be undertaken at the end of next month, while the work of doubling the line in High Street will be carried out in October.

Uruguay.—La Transatlantica Electric Tramway Co., of Monte Video, had, at the end of 1909, 64·48 km. of line, and carried during the year 21,996,832 passengers, as against 17,945,662 in 1908. The revenue was $937,338 gold, as against $769,809 gold, and the expenses $637,189, as against $581,655; the profit for the year was $300,148, as against $188,154.

TELEGRAPH and TELEPHONE NOTES.

Argentine Telegraph Proposals.—The Postmaster-General is studying the question of introducing wireless telegraphy throughout the country. He is of the opinion that this system will be much cheaper than landlines. The basis of the project is a State monopoly of all wireless telegraphy in the country.

Fire Alarms and Telegraphs.—The Glasgow Lighting Committee has received a communication from the Postmaster-General to the effect that, it having been reported to him that telegraphic communication had been established by means of circuits between fire stations in the city and a number of fire-alarm posts, he had been advised that the use of these circuits by members of the public, infringed the exclusive telegraph rights conferred on him by the Telegraph Act of 1869, but that he was prepared to sanction the continued use thereof on the conditions set forth in that communication. It was agreed that, whilst authorising the town clerk to repudiate the claim made, that official submit a report embodying his legal views on the contention of the Postmaster-General. The town clerk has now submitted the report, and the Sub-Committee has agreed to recommend that its previous decision to repudiate the claim made by the Postmaster-General be adhered to.

The Pacific Cable.—The new direct wire between Bamfield Creek Cable Station and Montreal has been completed by the Canadian Pacific Railway and handed over to the Pacific Cable Board. It is expected that this new arrangement will reduce the average time of transmission between Australasia and London by 15 minutes.

(*Continued on page* 345.)

New Post Office Telephone Exchange, Glasgow.

On Saturday, August 13th, the new Exchange, which has been installed on the top floor of the new Parcels Post Office in Waterloo Street, Glasgow, was informally brought into use; some 5,000 subscribers were changed over from the old Central Exchange, with the usual rapidity with which this operation is performed, and with the exceptional—we believe, unique—feature that the exchange faults recorded did not exceed 10 in number.

It will be remembered that the Glasgow municipal telephone system was originally carried out on the "call-wire" system, which has long been superseded in most places by modern methods. The new exchange, of course, is on the common-battery system, which enables an operator to deal with more than twice as many calls a day, and possesses other advantages which render it pre-eminently the most efficient and satisfactory system of exchange telephony at the present day. Provision has been made in the new installation for 10,000 lines, to accommodate subscribers'

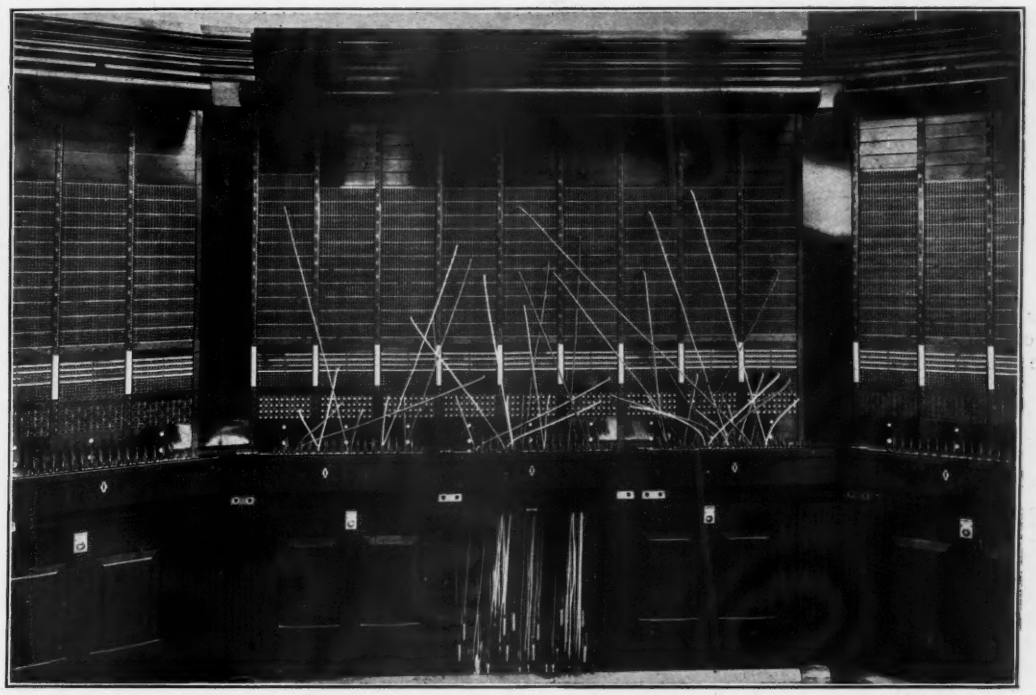


Fig. 1.—Subscribers' Answering Position, Front View.

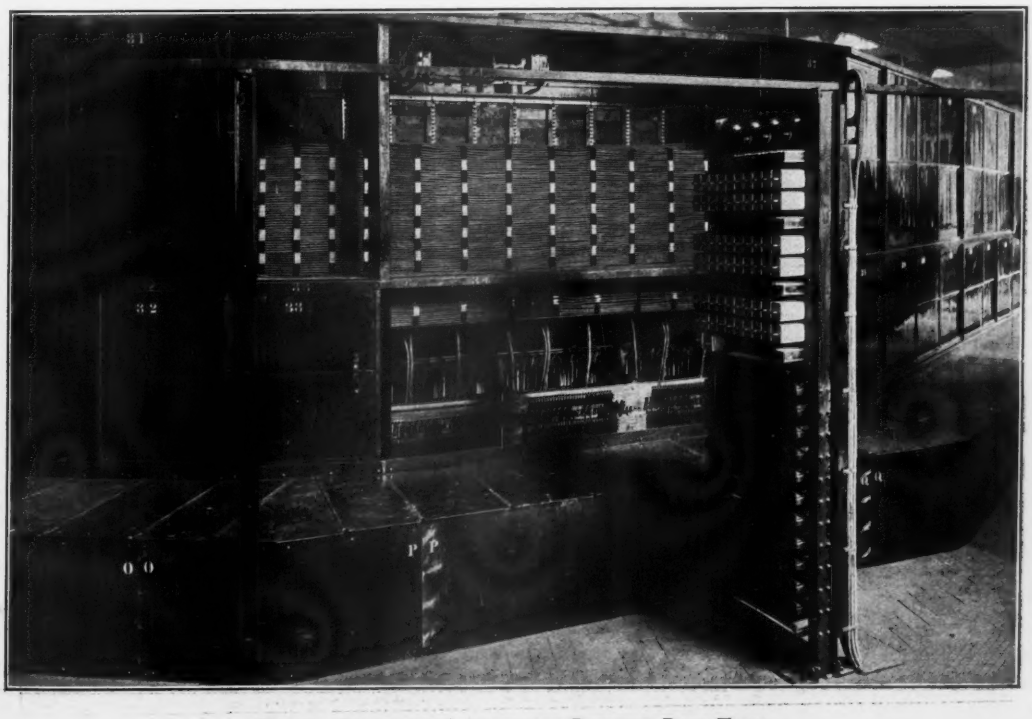


Fig. 2.—Subscribers' Answering Position, Back View.

circuits which will be transferred to it from other exchanges. An exhaustive description of the new exchange was published in the January issue of the *Post Office Electrical Engineers' Journal*, from the pen of Mr. J. W. Turner, A.I.E.E., a member of the staff of the Engineering Department of the General Post Office, London. From this we abstract the following particulars of the equipment, while for the half-tone illustrations we are indebted to the Peel-Conner Telephone Works, Ltd., of Queen Victoria Street, E.C., who carried out the whole of the work.

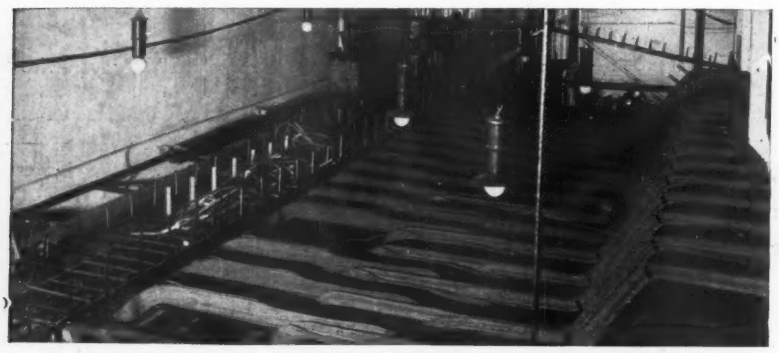


Fig. 3.—Cabling Above Frames and Racks.

The paper-core lead-covered cables from the street are brought into the basement through 50 ducts and are led up a cable chute to a mezzanine floor, entering the test-room about 3 ft. above the top of the main distributing frame, along which they are carried by an overhead cable-run. On this cable-run are made the joints between the paper-core cables and the silk and cotton-core cables running down into the frame, the length of the latter type of cable being thus reduced to the minimum.

The apparatus on both sides of the distributing frames, meter racks and relay racks has been arranged vertically, so that extensions can be carried out easily when required by increasing the horizontal length of the racks and frames. The line side of the main frame, on which the fuses are mounted, has a capacity for 16,560 circuits, arranged upon 69 verticals of 240 each; the exchange side, on which the heat coils and lightning protectors are fitted, has a capacity for 13,800 circuits, on 69 verticals of 200 each. The bunches of wires from the cables to the fuse mountings are carried in the horizontal channel irons to which the mountings are fixed, leaving the cross-connection field clear. Sheets of uralite are fitted underneath each horizontal layer of the cross-connections, to reduce fire risk.

The meter rack has a capacity for 10,200 meters, and each of the two relay racks provides for 5,400 line and cut-off relays. The intermediate distributing frame provides for 12,400 circuits.

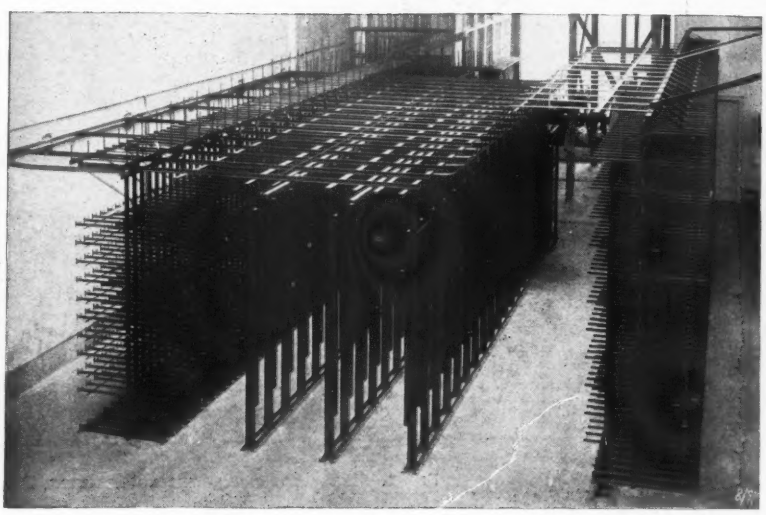


Fig. 4.—Frames and Racks Ready for Equipment and Cables.

The subscribers' switchboard consists of 28½ equipped sections of the three-position nine-panel type, with subscribers' multiple capacity for 14,400 lines and equipment

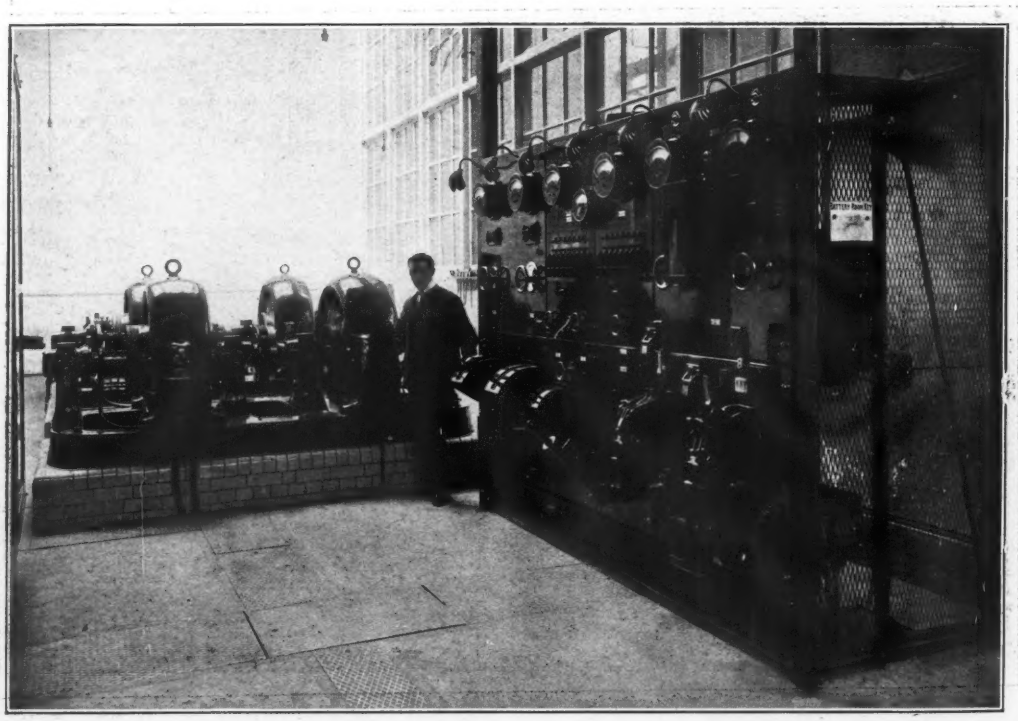


Fig. 5.—View Showing Power Board and Motor-Generators.

for 10,000 lines, as well as for 960 outgoing junctions, which are multipled every two positions. The whole of the relays, condensers and resistance spools associated with the cord circuits are mounted upon apparatus racks behind the sections. At each position space is provided for 150 answering jacks and lamps, of which 120 are equipped; and each keyboard is equipped for 17 cord circuits and 40 out-going order-wire circuits.

The junction switchboard includes 12⅓ equipped sections, with apparatus racks behind them. The outgoing junction multiple is fitted for 360 junctions; 26 incoming junction circuits per position are provided, and the subscribers' multiple is similar to that on the subscribers' sections. The wiring provides for incoming junctions from the trunk, common-battery, call-wire and call-key exchanges, as well as for other circuits, and provision is made to facilitate the conversion of other systems to the common-battery system in the future.

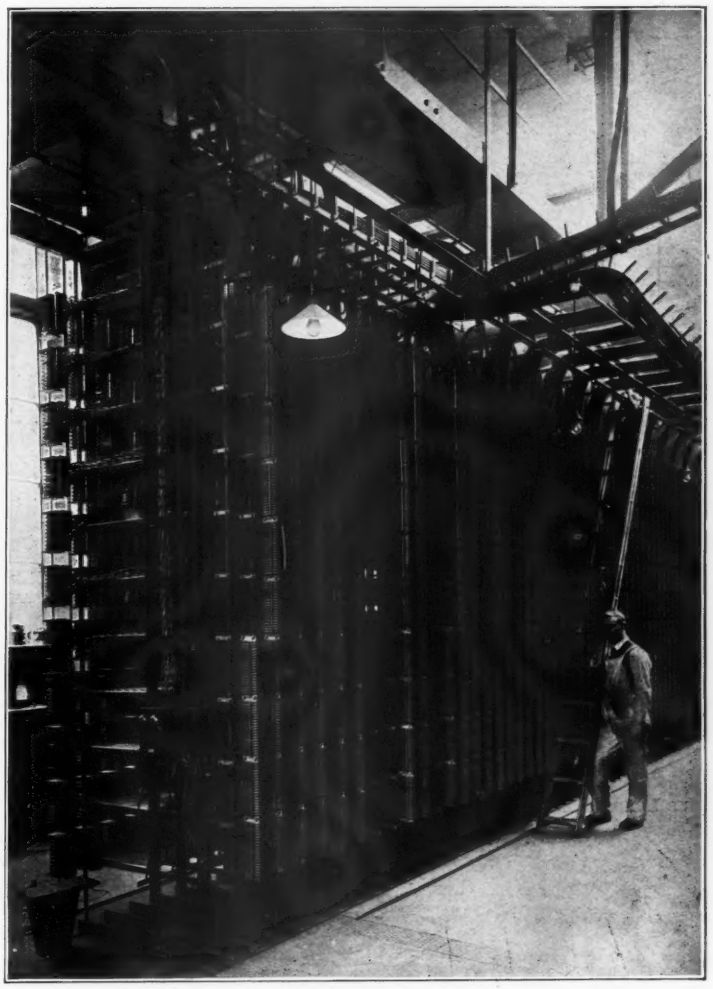


Fig. 6.—Distributing Frames.

The power plant, which was constructed by the General Electric Co., Ltd., at their Witton Works, is erected in the test-room, with the common battery in an adjoining enclosure. Two motor-generators have been provided, each consisting of a 49-H.P. motor direct-coupled to a 30-KW. generator; two independent three-wire D.C. services from the Corporation's supply mains have been put in, from either of which the motors can be driven at 500 volts. One of the ringing generators is driven by a motor off the 250-volt mains, while the other is driven from the 40-volt battery. In view of the reliability of the duplicate services, only one battery has been provided, to which either generator can be connected by a 1,000-ampere two-pole double-throw switch, through a "Stanley Edgewise" circuit-breaker, to which we shall refer later. The battery consists of 20 Chloride cells, having an ultimate capacity of 3,230 ampere-hours at the 9-hour rate, though the plates at present

Fig. 7.—Intermediate Frame; Local Side.

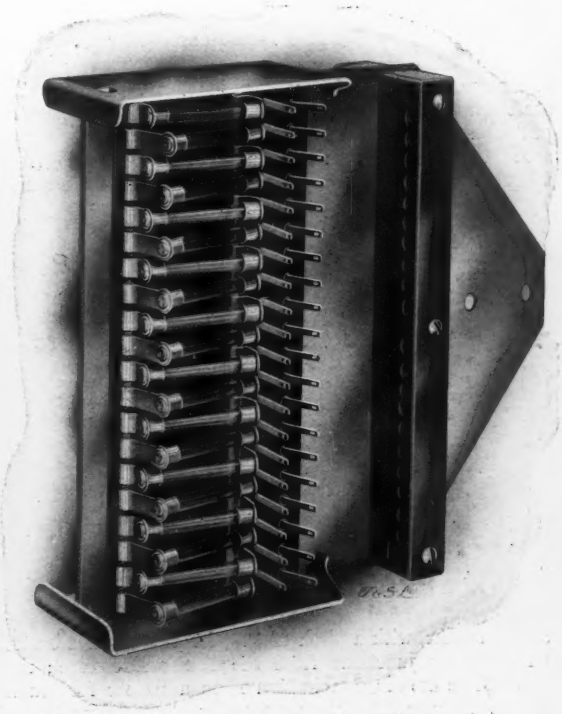


Fig. 8.—Mounting for 40 Fuses. Line Side, Main Distribution Frame.

provided are for 2,720 ampere-hours only. A 500-ampere fuse protects the battery.

The ringing generators, which are belt-driven from small motors, provide for seven different functions. The armature shaft carries a divided ring giving positive and negative pulsations for the operation of party lines, and two high-speed tone-interrupters: one, having a pitch of 400 vibrations per second, for busy-back and plugging-up circuits; and the other, with a pitch of 133, for the trunk tone-tests on incoming junctions from the Trunk Exchange; these two will be used in combination when a "clear for trunk" circuit is installed. Each generator shaft drives through worm-gear a shaft running at 10 R.P.M., which carries low-speed interrupters for the machine-ringing arrangements on the junction board, and for the flashing signals for the "busy-back" and "clear for trunk" circuits. Either set can be brought into use by means of two 7-way double-throw switches.

The accompanying illustrations show the various parts of the installation as erected. It is of interest to note that this is the

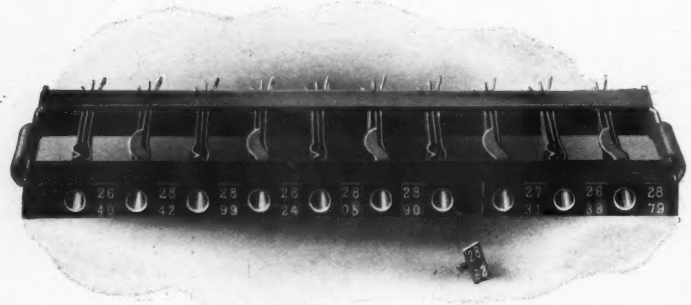


Fig. 9.—10 Answering Jacks (One Label Removed and Shown Separately).

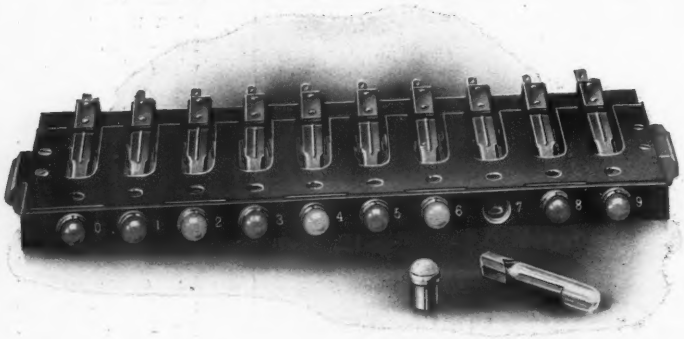


Fig. 10.—Lamp-Jack for 10 Line Lamps (One Opal Cap and Lamp Withdrawn).

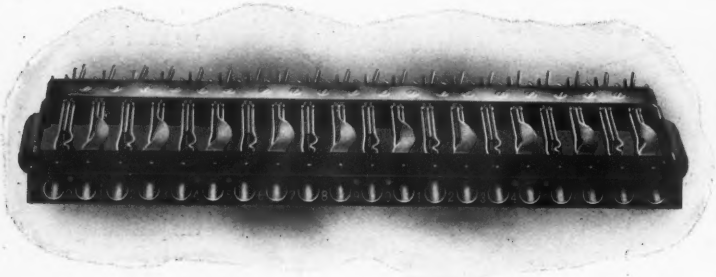


Fig. 11.—20 Multiple Jacks.

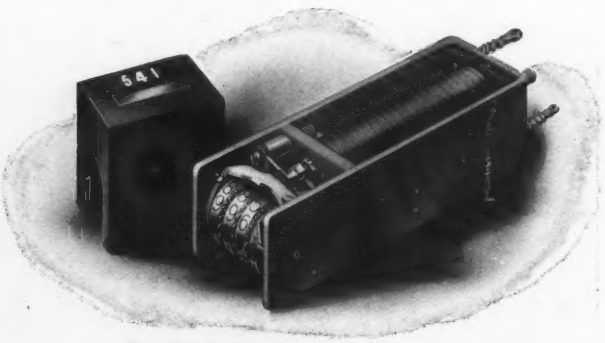


Fig. 14.—Subscribers' Meter.

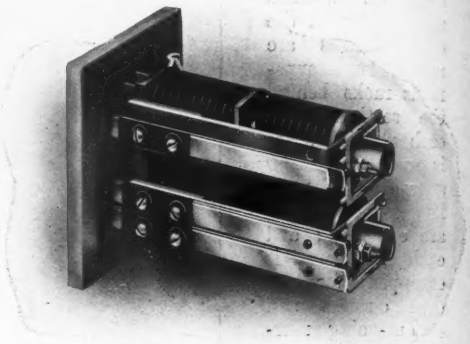


Fig. 12.—Line Relay (Above). Cut-off Relay (Below).

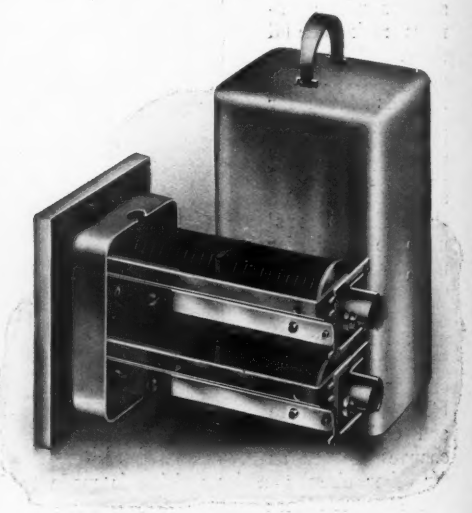


Fig. 13.—Pair of Supervisory Relays, with Cover.

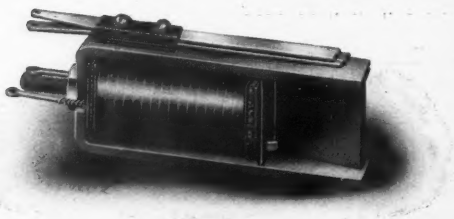


Fig. 15.—Alternating or Pulsating Current Relay.

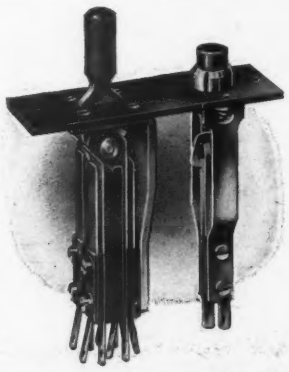


Fig. 16.—Ringing and Speaking Key (Left) and Meter Key (Right).

largest common-battery exchange yet installed that is exclusively of British design and manufacture throughout, and it marks the entry of a new competitor (the Peel-Conner Telephone Works, Ltd.) into the field. An important innovation in the design is the adoption of a 40-volt system instead of the usual 24 volts; the higher voltage is more suitable for use with long lines of comparatively high resistance, and enables greater uniformity of transmission to be obtained than is possible with lower voltage, while it also renders it unnecessary to employ supplementary cells for operating the meters, as in other systems. A further advantage of the higher voltage is the possibility of using relays with a larger number of turns, giving greater sensitiveness and reliability of action, and reducing the quantity of apparatus required in many of the circuits. The presence of high impedances between the common battery and the conductors of the cord circuit, ensures an exceptionally silent system, there being 200-ohm supervisory relay coils in circuit with either pole of the battery. The lamp-jacks are constructed entirely of metal, reducing fire risk, and the answering and multiple jacks are so constructed that the plug beds between the A and B springs, instead of both contacts being on the same side of the plug as hitherto, thus ensuring more even wear.

The arrangement of the principal circuits will be dealt with in a later issue.

(*To be concluded.*)

TRADE STATISTICS OF EGYPT, 1909.

THE following statement, showing the imports of electrical and similar goods into Egypt during the year 1909, is taken from the recently issued trade statistics. The figures for 1908 are added for purposes of comparison, and notes of any increases or decreases are given:—

	1908. £E.	1909. £E.	Increase or decrease. £E.
Steam engines, including boilers, &c.—			
From Great Britain	98,000	77,000	— 21,000
„ Germany	16,000	8,000	— 8,000
„ Belgium	2,000	3,000	+ 1,000
„ United States	1,000	1,000	—
„ France	18,000	2,000	— 16,000
„ Greece	—	1,000	+ 1,000
„ Holland	—	1,000	+ 1,000
„ Italy	6,000	6,000	—
„ Switzerland	5,000	10,000	+ 5,000
„ Austria-Hungary ...	6,000	—	— 6,000
Total ...	152,000	109,000	— 43,000
Electric machinery (including gas engines and petrol engines).—			
From Great Britain	37,000	22,000	— 15,000
„ Germany	4,000	11,000	+ 7,000
„ Austria	1,000	1,000	—
„ Belgium	8,000	11,000	+ 3,000
„ United States	2,000	1,000	— 1,000
„ France	8,000	5,000	— 3,000
„ Italy	1,000	4,000	+ 3,000
„ Sweden	1,000	—	— 1,000
„ Switzerland	29,000	8,000	— 21,000
Total ...	91,000	63,000	— 28,000
Other machinery (except agricultural).—			
From Great Britain	74,000	68,000	— 6,000
„ Germany	31,000	26,000	— 5,000
„ Austria	9,000	4,000	— 5,000
„ Belgium	3,000	7,000	+ 4,000
„ United States	22,000	20,000	— 2,000
„ France	35,000	23,000	— 12,000
„ Greece	1,000	1,000	—
„ Holland	1,000	—	— 1,000
„ Italy	5,000	3,000	— 2,000
„ Switzerland	3,000	5,000	+ 2,000
„ Turkey	—	1,000	+ 1,000
Total ...	184,000	158,000	— 26,000
Railway and tramway carriages.—			
From Great Britain	219,000	1,000	— 218,000
„ Belgium	47,000	14,000	— 33,000
Total ...	266,000	15,000	— 251,000
Lamps of all kinds.—			
From Great Britain	4,000	8,000	+ 4,000
„ Germany	11,000	16,000	+ 5,000
„ Austria	20,000	21,000	+ 1,000
„ Belgium	—	1,000	+ 1,000
„ United States	1,000	—	— 1,000
„ France	7,000	7,000	—
„ Italy	1,000	1,000	—
„ Sweden	14,000	12,000	— 2,000
„ Turkey	1,000	1,000	—
„ Other countries ...	2,000	1,000	— 1,000
Total ...	61,000	68,000	+ 7,000
India-rubber and gutta-percha, raw or manufactured.—			
From Great Britain	8,000	6,000	— 2,000
„ Germany	11,000	14,000	+ 3,000
„ Austria	5,000	3,000	— 2,000
„ France	9,000	15,000	+ 6,000
„ Italy	6,000	4,000	— 2,000
„ Switzerland	1,000	—	— 1,000
Total ...	40,000	42,000	+ 2,000
Scientific instruments.—			
From Great Britain	13,000	19,000	+ 6,000
„ Germany	16,000	17,000	+ 1,000
„ Austria	2,000	1,000	— 1,000
„ United States	3,000	2,000	— 1,000
„ France	14,000	9,000	— 5,000
„ Italy	1,000	1,000	—
„ Switzerland	1,000	1,000	—
Total ...	50,000	50,000	—
Electric, telegraphic and telephonic apparatus.—			
From Great Britain	50,000	43,000	— 7,000
„ Germany	15,000	13,000	— 2,000
„ Austria	22,000	12,000	— 10,000
„ Belgium	7,000	7,000	—
„ United States	4,000	1,000	— 3,000
„ France	13,000	13,000	—
„ Italy	5,000	5,000	—
„ Sweden	1,000	3,000	+ 2,000
„ Switzerland	2,000	5,000	+ 3,000
Total ...	119,000	102,000	— 17,000

£E = £1 0s. 6½d.

Co-operation in Germany.—A further instance of co-operation in Germany is afforded by the formation at Mulhausen of the Upper Rhenish Power Works Co. with an ordinary share capital of £1,000,000. Among the promoters are the city of Mulhausen whose electricity works are being incorporated with the company; the Electric Light and Power Investment Co., of Berlin, which belongs to the Siemens and Halske group; and the Bank for Electrical Enterprises of Zurich, which is associated with the Allgemeine Co., of Berlin. The existing municipal station at Mulhausen is worked with a loan capital of £495,000, and realised gross profits of £25,000 in 1909, of which the sum of £16,000 was placed to the reserve fund, and the undertaking is to be transferred to the new company in exchange for shares at par. The object of the company is the production and distribution of electrical energy in Alsace-Lorraine, and Baden, and the utilisation of the water power of the Rhine below the German frontier near Basle. In this connection the composition of the promoters is of importance, as there are to be found working together the A.E.G. through the Zurich Bank, the Siemens & Halske Co. through the Electric Light and Power Co., and eventually the Lahmeyer Co., through the community of interests which is being established between the company and the Zurich Bank, and which aims at co-operation in respect of large capital expenditure. It is estimated that the total outlay to be incurred by the Upper Rhenish Power Works Co. will amount to £2,000,000 for works, hydro-electric plant and long-distance transmission lines, and one-half will be raised by the issue of shares and one-half by means of bonds. As to the projected hydro-electric works on the Upper Rhine, it may be recalled that the existing undertakings in operation are the Rheinfelden power plant, which belong to the A.E.G. or the Bank for Electrical Enterprises, and the Wangen electricity works in which the Lahmeyer Co. is interested, whilst the Felten & Guilleaume-Lahmeyer Works Co. is, among others, prominently concerned in the Laujenburg power works which were erected in 1908. It is, therefore, assumed that the co-operation of three of the leading firms in Germany in the Upper Rhenish Power Works Co. will also eventually bring about an understanding between the latter and the existing power stations on the Rhine in regard to the supply of power in certain districts.

SOME PRACTICAL HINTS REGARDING ELECTRIC TRAMWAY OPERATION.

[COMMUNICATED.]

The practical side of the electric tramways system, as it appears to the man who actually has to operate a car and to rectify any mistake which he makes owing to improper handling, has not received quite the amount of attention within recent years that the importance of the subject appears to justify. There is no doubt that such points of practice were fully emphasised in the earlier days when the whole subject of electric traction was a novelty, but at the present time it would seem as if engineers had progressed beyond the state when they thought it necessary to instruct the junior members of their staff in the practical points relating to their daily work. An examination of the majority of the papers delivered before engineering and similar societies, reveals the fact that considerable attention is given to theoretical, and in some cases problematical, statements, while there is hardly enough reversion to bed-rock practice, probably because it may seem to offer no new points of discussion.

At the same time there can be no possible doubt that many serious mistakes are made owing to the fact that practical knowledge is not more widely distributed, and it would therefore appear advisable, even at the risk of repeating information which has been expressed before, to bring forward some practical and simple points with which a man in charge of the operation of a tramways system is confronted. This is all the more important when it is remembered that a mistake of any magnitude on such a system may involve, not only a considerable amount of valuable machinery, but also a very grave danger to human life. It is therefore proposed briefly to mention a few of the smaller points relating to tramways.

When the overhead trolley wire breaks, either due to undue wear or to temperature conditions, it is almost certain that a good length of the wire will trail on the ground, and, moreover, it has a habit of coiling up owing to the tension to which it was formerly subjected. Any person accidentally touching this wire will naturally get a very severe shock, and the question is, what is the best method, which the driver of a car coming upon the scene should adopt, when he meets with such an emergency? In systems where telephones are installed in the bases of certain of the tramway poles, there is a temptation to telephone to the generating station and get the section made dead, but this is by no means the best practice, inasmuch as, during the period between starting to the telephone, and making the switchboard attendant understand which breaker he has to clear, there is ample opportunity for passers-by to get shocks which might prove fatal. The proper way to go to work in such an emergency is that directly the wire falls, or directly the driver appears on the scene, he should put his rubber gloves on (which should be carried on every car), take hold of the wire and hold it firmly in the groove of the rail. The effect of this is to produce a dead short-circuit which will bring out the circuit-breaker at the station. In every probability this circuit-breaker would be replaced several times until the attendant had recognised that something was radically wrong with that section and left the circuit-breaker out permanently. This would, however, only have meant a few minutes spent in holding the trolley wire into the rail, and in the meantime any chance of shocks would be obviated until the circuit was made permanently dead.

Coming now to the operation of the cars on the road, trouble is frequently experienced owing to the fact that the driver, in starting on a wet or greasy rail, or running uphill, puts too much sand on the tramlines. Where this is done, a bad earth contact is formed, and there will probably be a considerable amount of sparking between the wheels and the rails, which results in very rapid deterioration. This is, therefore, a practice which should be very carefully checked. Where sand is used so freely as to form a continuous covering to the rail, it is quite possible for the car to be unable to start, which means that the driver would be compelled to get off and clear some of the sand away from the rails before starting again. This is one of the difficulties in operation by unskilled men that is rather difficult to check, but if more attention were paid to this point, a good deal of the wheel turning which is at present done might be avoided. Another cause of rapid deterioration of car wheels is the way which some drivers have of applying their brakes too suddenly. It is quite a common sight to see a driver run his car at full speed up to a stopping place and then to pull it up in a few yards. This sort of thing looks very fine and clever, but causes a lot of trouble in tramway work, as it simply plays havoc with the wheels and brakes. The wheels, if locked in this way before the momentum of the car has been properly overcome, slide along the rails and develop flats, which are very difficult to turn out, inasmuch as the particles of grit and dirt in the track become embedded in the flattened surface when it is raised to a heat by friction, causing the skin thus formed to be hard enough to resist the finest turning tools which are made.

Another evil which is due to a careless driver, is that he does not sufficiently observe what lies in the way of his car, either in the groove of the rail or in the permanent way between the two rails. Considerable trouble has been caused by neglect of either of these two points. It may seem a counsel of perfection, but a suggestion may be made which will not commend itself to any but the most careful and conscientious car drivers. This is, that whenever such a driver feels a wheel of his car go over anything which appears to be lodged in the rail, he should stop his car and remove the obstacle, if possible. This is most important, as cases have been known when, owing to cars having passed successively over an obstacle in the groove, such an obstacle has become so firmly embedded in the rail that it has taken a very considerable amount of time to get it out again, when at last it has been reported upon and attended to. The destructive effect of such a thing as, for example, an iron bolt lying in the groove of a rail, both upon the rail itself and upon the wheels which pass over it, need only be mentioned to be understood. The other class of obstacle, that is to say, an obstruction lying between the rails is equally important. Drivers appear very often to think that because they are running on rails there is no need to look out for obstacles, but, as a matter of fact, if they take the trouble to examine the underside of their car they will see that there is really not very much clearance between the lowest point and the roadway. In one instance a car was run right over a big stone lying in the track in broad daylight, the driver having miscalculated the size of the stone and reckoning that his car would clear it. As a matter of fact, however, the stone managed to rip off the casing of one of the motors, and although the damage was not serious enough to stop the running of the car, the car had to be repaired when it was returned to the sheds, which repair, of course, cost money. Therefore, whether an obstacle is lying in the rail or on the track, a careful car driver will risk losing a small fraction of his schedule time and will take the little trouble necessary to get off and remove the obstacle.

A considerable amount of trouble is also found in tramway maintenance, through the fact that the car drivers do not pay sufficient attention to their controllers. One serious thing in this connection is that the driver does not take care to move the controller sharply and decisively from one notch to another. This is especially the case with novices who are apt to hesitate nervously between one notch and another, with the result that continuous arcing takes place between the moving and fixed contacts. This timed fooling with the handle results in the complete ruin of a good sound controller in a very short time, even when fitted with the magnetic blow-out, and brings up the cost of maintenance very appreciably. Another thing which a car driver should remember, is that where the driver's platform is not protected by means of a cab structure, there is danger in dirty weather of water lodging on the top of the controller and ultimately finding its way through on to the contacts. The result of this is that the water is very liable to short-circuit several of the contacts in the controller, with the result that the car and general traffic will probably be delayed for some time. It should be a very simple matter for the car driver to periodically wipe off the water from the top of the controller before enough has collected to run inside.

Although the care of the equipment does not altogether rest with the driver of a car, yet he should be responsible, to a fairly large extent, in the way of seeing that every part of his gear is working properly, and if this is not the case, should either try to remedy the same if it can be done speedily, or else report it to his superintendent. For example, a case occurred in which some grit or some other obstruction managed to find its way into the bearings of the trolley wheel of the car. The wheel must have become jambed soon after the car left the yard, and when it returned, after several hours' run, the groove in the top of the trolley wheel was worn quite flat. This meant that the wheel had to be replaced, and points out the fact that it is very necessary that trolley wheels should be carefully examined before the car leaves the yard. In nearly every instance quite a long run has to be made before its return to the sheds, and a lot of damage can be done to the trolley before probably any fault in this matter is noticed. Possibly the liability to this type of trouble accounts to some extent for the growing favour with which the bow collector is being viewed in this country.

Another somewhat unusual difficulty emphasises the importance of a car driver having his wits about him to appreciate whether his gear is working properly. In one case the brush hammers on one of the tramcar motors were left up when the car was cleaned, and the driver found during his run that when he was using both motors the automatic switch repeatedly blew out. He cut out first one motor and then the other in order to discover which was defective, but the fault was not located on the road, and the car had therefore to complete its journey on the one motor, with the result that it had a speed considerably lower than the schedule, and delayed the running to a certain extent. The driver could not probably be blamed for omitting to notice a point of this nature, but the instance shows what a very trivial cause can produce a large amount of inconvenience.

Some amount of trouble is sometimes caused by the carelessness of a driver in not making sure that all the wheels of his car are over the points of a junction or crossing before he reverses the car. When such a car is supposed to run over the points in one direction, and then to travel back on a branch line, it is quite possible, that if only the front wheels are over the points, the car will run completely off the rails when it is reversed, and the inconvenience which this oversight causes is too obvious to require demonstration. Somewhat analogous to this is the question of trolley pole design from the point of view of the trolley following the direction of the car. In designing cars, particularly those adapted for freight, it is very important to place the trolley pole so that the trolley is sufficiently behind the leading wheels of the car to follow its direction when it has to run over points on to a branch line. This has not always been sufficiently appreciated, and in cases where this has been overlooked the trolley pole has sometimes been placed right at the back of the car when running in one direction, and, obviously, it was situated right at the front of the car when running in the other. In one instance

of this sort, the car was of the open type made for freight work, and it was found that the result of having the trolley in this position was that just when the car wheels were over the junction, the trolley, instead of following on to the corresponding branch of the overhead trolley wire, went considerably past the junction in the original direction. It was, therefore, necessary to alter this particular design to the extent of having an iron girder or platform placed from one end of the car to the other, with the trolley pole fixed in the centre. The same sort of trouble can, however, occur in the ordinary construction when a sufficient length of arm is not allowed to enable the trolley wheel to be carried by the car in a position sufficiently far behind the leading wheels.

It will be seen that the whole of the above notes are of a strictly practical and somewhat elementary description, but the obvious bearing that they have upon the efficient working of a tramway system cannot be disputed. It is hoped, therefore, that these small points, which are not of sufficient magnitude to form the basis of a technical treatise, but which are constantly recurring in the ordinary life of a tramway superintendent, may be of sufficient interest to warrant their inclusion in the columns of a technical journal.

TELEGRAPH and TELEPHONE NOTES.

(*Continued from page* 338.)

Cape Colony.—A telephone trunk line has been opened for public use between Graham's Town and Port Alfred.

The Pacific Cable Board.—The report of the Board for the year ending March 31st last, shows some improvement as compared with the previous year. The international traffic accounted for 115,663 messages as against 103,812, the words being 1,356,136 as against 1,225,048. There was a large increase in Press messages consequent on the cheapening of cables rates in deference to opinions expressed at the Imperial Press Conference. The net revenue was £111,500, an increase of £400, which would have been £2,600 but for delay in crediting certain money to the Board. After allowing £30,000 for renewals, some £18,000 remained available for reducing the annual contributions of the Governments interested in the undertaking.

Telegrams by Telephone.—It is stated that the officials of the G.P.O. have held a meeting to consider the extension of facilities for communicating telegrams by telephone to P.O. subscribers in the provinces, and that in the near future at least half a dozen of the large centres of population will be brought within the range of the scheme.

The Telephone Transfer.—Speaking at Saltburn on Monday, the Postmaster-General contradicted the rumour that the Post Office would or could temporarily dispense with the staff of the National Telephone Co., when its business was transferred. Mr. Samuel said the whole staff of the company (with the few exceptions already announced, and on lines which have been well understood by the Telephone Co.'s staff) will be transferred to the service of the Post Office. The preliminary arrangements are already actively proceeding, and no change of policy has been decided upon. While this statement has given satisfaction, it is pointed out that uncertainty still exists as to the terms on which the staff will be transferred.

Underground Telegraphs.—Some two or three years ago, the underground telegraph cables between London and Leeds were brought into use. Since then, the work of extending the underground connection to Newcastle-on-Tyne has been in progress, and according to the local papers, the last remaining section, between Leeds and Stockton, is now being taken in hand. A further extension of the underground service from Leeds to Hull, is contemplated next year.

Uruguayan Wireless Contract.—According to the *Review of the River Plate*, the following are the particulars and cost of the wireless telegraph stations which the Government has contracted for with the Telefunken Co., of Berlin:—The stations to be installed are as follows: Monte Video, with a minimum range of 800 km. (497 miles). Paso de los Toros and Rivera, range 500 km. (310 miles). Lobos Island and Banco Ingles, range 80 km. (49 miles). On the cruiser *Monte Video*, range 400 km. (248 miles). On the gunboats 18 *de Julio* and *Oyarvide*, range 100 km. (62 miles). Two military stations, transportable on wheels, range 200 km. (124 miles), and four flying stations transportable on horseback, range 60 km. (37 miles), these also being for army use. The prices to be paid are as follows: Land stations of 800 km., $18,250 each. Ditto of 500 km., $11,750. Lighthouse stations of 100 km., $2,280. Vessel stations of 400 km., $4,750. Ditto of 100 km., $2,685. Transportable military stations of 200 km., $8,000. Ditto of 60 km., $2,389. These prices include the teaching of the necessary working staff. The stations are to be installed and in working order before December 31st of the current year.

CONTRACTS OPEN and CLOSED.

OPEN.

Aberaman.—September 12th. Electrical goods, for the Powell Duffryn Steam Coal Co., Ltd. Stores Manager, Aberaman offices, near Aberdare.

Australia.—August 30th. Telegraph and telephone material, for the P.M.G.'s Department in Victoria. See "Official Notices" July 29th.

September 7th.—Battery material and glassware for the P.M.G.'s Department in Queensland. See "Official Notices" July 22nd.

September 20th.—Telegraph and telephone material, for the P.M.G.'s Department in Victoria. See "Official Notices" August 5th.

September 27th.—Electric lamps for the P.M.G.'s Department in Victoria. See "Official Notices" August 12th.

October 4th.—Telegraph and telephone insulators for the P.M.G.'s Department in all States. See "Official Notices" August 12th.

October 4th.—Telegraph and telephone material, for the P.M.G.'s Department in Victoria. See "Official Notices" August 19th.

October 4th.—Telephone material, for the P.M.G.'s Department in Victoria. See "Official Notices" August 19th.

October 5th.—5,000 porcelain insulators, for the P.M.G.'s Department in New South Wales. See "Official Notices" August 19th.

October 17th.—Telegraph and telephone material, for the Deputy Postmaster-General, Hobart. Commonwealth High Commissioner's Office, 72, Victoria Street, London.

Belgium.—The Belgian State Railway authorities at the Bourse, Brussels, are about to invite tenders for an installation of electric lighting at the railway station at Ath.

Calcutta.—September 19th. Motor-generators, turbo-alternators and condensing plant for the Cossipore station and sub-stations of the Calcutta Electric Supply Corporation, Ltd. See "Official Notices" to-day.

Canada.—Winnipeg.—September 1st. Manufacture, delivery and installation of 46,000 ft., 13,000-volt three-core cable; specifications from Power Engineer's Office, Winnipeg; tenders to M. Paterson, Secretary, Board of Control. The specification and conditions may be seen by British makers at the Commercial Intelligence Branch of the Board of Trade.

The *Canadian Engineer* states under the heading Fort William, Ont., that the Joint Street Railway Board favour the purchase of an electric locomotive, to cost about $15,000.

Carlisle.—September 5th. Coal storage and conveying plant for the City Electricity Department. See "Official Notices" August 19th.

Chile.—September 30th. Three multiple dynamos and searchlights, also machines and tools, for the Chilian Navy. Deposit, 5 per cent. of estimate. Particulars from and tenders to the Junta Económica, Dirección del Material, Valparaiso. See *Board of Trade Journal*.

Egypt.—October 20th. Electrical installation and refrigerating plant, for asylum at Khanka. Specification from Chief of Administrative Service, Public Works Department, Cairo; for particulars as to tendering see *Board of Trade Journal*.

France.—November 1st. The Prefect of the Department of the Yonne, at Auxerre, is inviting offers for the construction of a system of metre-gauge electric or steam railways in the Department, the aggregate length of the proposed lines being about 233 kilometres.

Germany.—The municipal authorities of M. Gladbach are about to invite tenders for the construction of an electric tramway between the town and Neuweck.

G.P.O.—September 26th. Swedish, Norwegian, Finland or Russian Red Fir telegraph poles; also tenders for creosoting, &c., telegraph poles. G. Morgan, Controller of Stores, Stores Department, G.P.O., 17-19, Bedford Street, London, W.C.

Lancaster.—Six 25-H.P. shunt-wound motors, with starting switches, for Messrs. Waring & Gillow, Ltd. See "Official Notices" August 12th.

London.—L.C.C.—August 30th. Wiring and fittings for electric lighting of the second section of the Woolwich Road car depôt. See "Official Notices" July 22nd.

L.C.C.—August 30th. Covering cables with asbestos tape. See "Official Notices" August 5th.

Hackney.—September 15th. Extension of the main switchboard, for the Borough Electricity Department. See "Official Notices" August 12th.

Poplar.—August 31st. Electrical supplies, for a year, for the B.G. G. H. Lough, clerk, 45, Upper North Street, Poplar.

Manchester.—September 6th. Steel girder tramway rails, for the Tramways Committee of the T.C. J. M. M'Elroy, general manager, 55, Piccadilly, Manchester. (Returnable deposit, £1 1s.)

Mountain Ash.—September 12th. Electrical stores for 12 months, for the U.D.C. See "Official Notices" to-day.

Mozambique.—October 12th. The authorities of the Harbour and Railway at Lourenco-Marques, Mozambique, are inviting tenders for the supply of seven electrically-operated cranes, ranging in capacity from 1 to 10 tons.

New Zealand.—December 15th. Installations of wireless telegraphy at Doubtless Bay, Gisborne, Cape Farewell, Sumner and Bluff. See "Official Notices" August 5th.

Pontypridd.—September 5th. Low-tension rubber-insulated cables, with lead or fireproof covering, for the Corporation Electricity Department. See "Official Notices" to-day.

Rawtenstall.—Tenders are to be obtained for the extension of the high-tension switchboard in connection with the electricity works.

Rochdale.—The Tramways Committee is to advertise for tenders in connection with the further extension of the tramways from the Red Lion, Shawforth, to the Bacup borough boundary.

Salford.—September 1st. Vertical steam-feed pump for Salford T.C. electricity works, Pendleton; Borough Electrical Engineer, Frederick Road Works, Pendleton (returnable deposit of £1 1s.)

West Ham.—September 1st. Electrical fittings for a year, for the B.G. Thos. Smith, clerk, Union Road, Leytonstone, N.E.

CLOSED.

Buenos Ayres.—A River Plate exchange says that a tender for the electric light installation of the Custom House offices, at $249,462·04, has been accepted.

Canada.—According to the *Canadian Engineer* the construction department of the Safety Insulated Wire and Cable Co. has been awarded a contract for laying electrical underground conduits for the city of New Britain, Conn., for approximately $14,050.

The same contemporary also publishes the following items:—

Vancouver, B.C.—The Electrical Construction Co. has received the contract for the installing of ornamental street lighting, at $15,940. The contract for lamp standards was let to the Ross and Howard Iron Works, at $45 each. Other bidders for material, &c., were: The Hinton Electrical Co., at $17,625; Cope & Son, $21,875; for lamp standards, The Vancouver Engineering Works, Ltd., at $49 each.

New Hamburg, Ont.—Contracts for electrical apparatus were awarded to the Packard Electric Co., Ltd., for transformers, ; to the Canadian Westinghouse Co., for switching apparatus, and to the Siemens Bros. Dynamo Works, for dynamos.

Belleville, Ont.—The City Council has accepted the tender of the Canada General Electric Co. for a 115-h.p. motor for waterworks, at $2,660.

Cape Town.—The following tenders were received for the laying of high-tension cables on the foreshore for a distance of about half a mile from the power station:—

Siemens, Ltd., Cape Town, cable and boxes, f.o.b. London, delivery five weeks	£159 10
Henley's (S.A.) Telegraph Works Co., Ltd., Johannesburg, delivery eight weeks	165 0
Western Electric Co., Ltd., Johannesburg, delivery 12 weeks	142 10
Telegraph Manufacturing Co. (Colonial), Ltd., Cape Town, delivery eight weeks	146 0

The tender of the Western Electric Co. was accepted, provided the firm was prepared to guarantee delivery within eight weeks; failing which, the tender of the Telegraph Manufacturing Co. is to be accepted.

Crewe.—The Education Committee has accepted the tender of Messrs. Carrington & Button for supplying electric fittings to the new Bedford Street Schools.

Dartford.—The U.D.C. has accepted the tender of the Baker Oil Separator Co., Ltd., for an oil separator, with accessories, at £168.

France.—The French Post and Telegraph authorities in Paris have just placed contracts as follows:—La Compagnie Francaise du Bimetal, Paris, 150 tons of bimetallic wire 2 mm. dia., at 1,825 fr. per ton; La Société d'Electro-Metallurgique de Dives, 50 tons ditto 3 mm. dia., at 1,885 fr. per ton, and La Compagnie Francaise des Metaux, of Paris, 50 tons ditto, at 1,882½ fr. per ton.

Glasgow.—The T.C.'s Tramways Committee on Works and Stores recommend the acceptance of the following tenders:—

Special track work.—Edgar, Allen & Co., Ltd.
Copper bonds.—Lahmeyer Electrical Co., Ltd.

Launceston (Tas.).—The *Australian Mining and Engineering Review* for July 5th states that the Launceston City Council has received the following tenders in connection with the electric tramway scheme:—

Overhead equipment.—British Insulated and Helsby Cables, Ltd., £2,148.

Permanent way.—J. & T. Gunn, Ltd., £8,494; W. J. Bird & Co., £15,405; Cheverton & Williamson, Hobart, £10,394; F. A. McCarty & Co., Melbourne, £11,565; Barry & Cowdery, Sydney, £10,604.

Sub-station equipment.—H. Gardner & Co.; Siemens Bros. Dynamo Works, Ltd.; Brush Electrical Engineering Co.; Noyes Bros., Proprietary, Ltd.; Dick, Kerr & Co.; Haes & Eggers; Pfaff, Pinschoff & Co., Proprietary, Ltd.; Gibson, Battle & Co.; Australian General Electric Co.; Wm. M'Lean & Co.; T. K. Steanes; Staerker and Fischer.

Contracts have already been entered into for the supply of motor equipments and trucks, the former being supplied by the General Electric Co., U.S.A. (price £3,206); and the under-carriages (price £1,492) by the Brush Electrical Engineering Co., England.

Government Contracts.—The following tenders have been accepted during the past month by the Government Departments named:—

War Office.

Paper-insulated cables.—Western Electric Co., Ltd.
Conductors and supports, Aldershot electricity supply.—British Insulated and Helsby Cables, Ltd.
Electric motors.—Electric Construction Co., Ltd.; Siemens Bros.
Internal wiring, Institution, Ewshott Camp.—G. E. Taylor & Co.

India Office, Store Department.

Accumulators, &c.—Pritchetts & Gold.
Cables.—British Insulated and Helsby Cables, Ltd.
Dynamos, &c.—Stone & Co.
Fans.—Veritys, Ltd.
Motors.—Lancashire Dynamo Co.
Troughing.—Dorman, Long & Co.

General Post Office.

House telephone apparatus.—Gent & Co., Ltd.
India-rubber and cotton-core cable.—British Insulated and Helsby Cables, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.
Cable, paper core.—Johnson & Phillips, Ltd.; Callender's Cable and Construction Co.
Submarine cables.—India-Rubber, Gutta-Percha, &c., Works, Ltd.
Supply of and laying cable.—Siemens Bros. & Co., Ltd.
Dry cells.—Siemens Bros. & Co., Ltd.
Insulators.—Bullers, Ltd.; Bourne & Son.

Office of Works.

Erection of Glasgow (Cubie Street) Telephone Exchange.—F. Rodger.
" North Shields Telephone Exchange.—G. Park.
" Putney Telephone Exchange.—F. G. Minter.

Maidstone.—The T.C. has accepted the tender of Messrs. Arthur Lowcock, Ltd., for an economiser, with feed pipes, &c., at £343 10s.

Perth.—The Perth Tramway Advertising Co., whose offer was £340, secured the contract for advertising in the Corporation tramcars.

Portsmouth.—The tender of Messrs. Walter Scott, Ltd., of £7 10s. per ton for steel rails, has been accepted by the Tramways Committee.

Rawtenstall.—The T.C. has accepted the following tenders in connection with the Whitewell Valley tramways, viz.:—

Clough, Smith & Co., Ltd., London.—Overhead equipments.
W. T. Glover & Co., Ltd.—Cables and ducts.
Underwood & Brother, Dukinfield.—Construction of permanent way.

NOTES.

Electric Power on the Rand.—The *Financial News* of 22nd inst., in the course of an article headed "Another Million for Dividends: Benefits to be Derived from the Approaching Electrification of Mines," quotes from an address to the Transvaal Institute of Mechanical Engineers by its president, to show that the introduction of electric power generated in bulk means an automatic expansion in Rand mining companies' dividends of 12 per cent. These dividends in 1909 were £9,070,852. Another economic advantage anticipated is a mitigation of the native labour difficulty in the newer mines where the use of locomotives driven by electric or other power will make it possible to dispense with the coloured labour previously necessary for hand tramming, and will provide employment for a few extra whites.

German Industrial Bank Failure.—A week or two ago the following appeared in the *Financial Times*:—

"The failure of the Niederdeutsche Bank is a witness to the danger which applies to the German system of banking. English bankers have often been criticised for not identifying themselves closely with industrial affairs. As a matter of fact, they prefer to see an industrial firm converted into a joint stock company by means of the aid of the ordinary financier who deal with those matters. On the Continent it is more the custom for a bank to directly participate in such an operation, and whilst in many cases the investing public benefits from the interposition of the banks, there is always the danger that this interest in company promotion may be carried too far. In the case of the Niederdeutsche Bank this would seem to have been the case, for it got identified with a number of industrial concerns which simply depended upon it, and, we should imagine, sucked all the strength from the banking institution. For some time past it has made frantic efforts to obtain deposits, and its liquidation is expected to lead to the downfall of some of the industrial undertakings which had been dependent upon it."

Australian Electric Lighting Enterprise Hindered.—We have received from an Australian correspondent a Brisbane newspaper containing an article entitled: "Overhead Electric Wires; Suggested Amendment of the Act; Northern Enterprise Hindered," which illustrates some of the difficulties under which the electric lighting industry suffers in the State of Queensland, owing, as our correspondent says, "to the enactments of an Electric Lighting Act based on the lines of your British Act, but of a more stringent character, inasmuch as it forbids any distribution of electricity otherwise than by an Order in Council." The newspaper report states:—

During the past year the Electrical Association of Queensland has endeavoured on several occasions to secure an amendment of the clauses in the Electric Lighting and Power Act of 1896 which deal with the conditions under which overhead electric wires may be laid. So far the association has not met with definite success, but hopes are expressed that something will shortly be done by the Government to improve the present state of affairs. At the present time it is necessary before an overhead wire can be laid, to first secure the consent of the local authority in whose district it is to be placed, and, secondly, the consent of the Minister. If the regulations ended here no exception would be taken to them, but there is another clause which provides that if any local authority at any subsequent date considers any overhead wire to be dangerous, or likely to become dangerous, any two justices of the peace may hear such complaint, and may make an order directing the removal of such wires. The insecurity of tenure resulting from this provision has naturally proved fatal to the overhead wiring system in the State.

In one or two towns, such as Rockhampton and Charters Towers, local companies have been constituted electric lighting authorities, and have attempted to carry out their schemes with the underground wire system, but in both cases the cost of construction and maintenance has apparently proved too much, and one of the two towns concerned has disposed of its plant, while the other has at present a very large debtor balance in connection with the scheme.

At Atherton recently, a well-known business man—Mr. James Thomas—projected a scheme for the erection of an electric power plant to supply electricity for power and lighting purposes to the townships of Atherton and Tolga, and the surrounding villages. It was also intended that the supply should be extended to the farming districts for use in farm machinery and for lighting purposes in the farmers' houses. Mr. Thomas, after carefully investigating the possibilities of the scheme, came to Brisbane to form his company, the preliminary capital of which was to be about £26,000, but his intentions received a sudden check when he discovered, on applying for advice to Mr. E. C. Barton, the conditions under which he would be compelled to erect his wires.

In the course of a conversation with a *Courier* representative, Mr. Thomas explained that it had been the intention of his company to obtain the power for its machinery from a neighbouring waterfall. Owing to the numerous creeks and gullies to be crossed, and to the difficult nature of the country generally, the overhead wire system was the only one which could be applied. The underground wire system would be an impossibility, according to the best experts of the State, in this particular district, and even if it was possible, the cost would be prohibitive. His scheme, he added, was sound and practical. In the district of Hawera, in New Zealand, he was informed water power was used for the generation of electricity, which was distributed over a district having an area of about 180 square miles, and used in the milking and other machinery of the farms as well as for lighting farmers' houses and for public and private lighting in half a dozen towns and villages. The present regulations appeared to him to be all the more ridiculous in view of the fact that while electric lighting companies were told that their insulated wires, which carry a 250-volt current were a public danger, the tramways company was allowed to erect bare and unprotected wires carrying 500 and even 600 volts. If he could not secure some amendment in the existing regulations his scheme must fall through. The scheme would prove a material advantage to one of the most prosperous districts in Queensland if it was carried out, and might mean the initiation of further and more important schemes for making use of the tremendous power obtainable from the Barron Falls.

Mr. Thomas pointed out that his grievance lay in the apathy of the local authorities of Queensland, who, through their association, have protested against any amendment of the Act in the direction of giving security of tenure to users of overhead wires, thereby shutting out electricity from all small towns and rural districts by private enterprise, while they were sitting on their rights, and during the 14 years' existence of the Act, had only in one single instance—Thargomindah—initiated an electric power and light supply in Queensland.

Incorporated Municipal Electrical Association.—Will those who are interested take note of the secretary's change of address?—On and after August 22nd, communications should be addressed to Mr. C. McArthur Butler, at 28, Bedford Square, London, W.C.

Reported Simplification of Wireless Telegraphy.—According to a Cherbourg communication to a French newspaper, the French Minister of Marine has forwarded to the Special Commission a scheme for "mixed telegraphy" devised by M. E. Debrix, a workman employed in the machine shops at Cherbourg Arsenal. The idea of the new invention is the influence of Herzian waves upon the Morse apparatus, or a combination of ordinary and wireless telegraphy. It is claimed that by this system it is possible for a wireless telegram sent from a ship at sea to be received by any convenient telegraph office, automatically and without interruption, and the establishment of inland stations for wireless telegraphy would be superfluous, but the existing coastal stations would continue in operation. The disadvantages of stations with high tension, which introduce complications, would in this way be avoided. The apparatus devised by M. Debrix is said to be cheap and to be applicable without large outlay to the apparatus working in the telegraph offices. Count Arco, the director of the Berlin Wireless Telegraphy Co., who has been interviewed on the subject of the technical value of the invention, is reported to have stated that, as far as could be judged, it relates to the connection of a wireless coastal station with the landlines. Hitherto the telegraphist at the coastal station has had to receive the wireless messages, and then send it on afresh through the landline, but this condition is to be removed by the invention. The possibility of such an invention, the director further remarked, always existed, but the technical difficulties are very considerable under the circumstances. Above all things, the difficulty of correcting telegrams arriving in a mutilated condition is enormous, and the Count attaches no great practical value to the invention.

Pit Bank Central Stations.—The supply of electricity and gas from pit bank stations of collieries or lignite mines, partly by companies working independently and partly by their securing the financial co-operation of the local authorities, continues to develop in various parts of Germany. In Rhenish-Westphalia the largest undertaking of the kind is the Rhenish-Westphalian Electricity Works Co., of Essen, which is an extensive power supply enterprise from the pit bank, and whose share capital is largely held by local authorities. This company has now concluded a 10 years' gas supply contract with the Altenessen Commune, which has assured itself of shares of £12,500 nominal value in the company, whilst the latter intends to establish a gas company for the purpose of carrying out the work. In addition, the Rheinbach District authority has arranged a 30 years' contract for the delivery of electric power by the Berggeist Electricity Works, of Bruhl, and has decided to advance to the latter on loan the necessary funds for the extension of its network and to subscribe for shares of £25,000 in the Rhenish-Westphalian Electricity Works, in whose hands the majority of the shares in the Berggeist Works are vested. On the other hand, the rural district of Dusseldorf, notwithstanding the advocacy of the provincial government and convention for the district, has refused an offer made by the Rhenish-Westphalian Electricity Works Co. of a participation of £25,000 in shares at the price of 150 per cent.—which is the usual price at which the local authorities take over shares in the company. The town of Hagen also appears indisposed to accept a proposal made by the same company to shut down the town gasworks and receive a supply of gas from the company, and the most strenuous opponent of the scheme is the Mayor, who was associated with the Mark Commercial Electricity Works Co., which was formed a few years ago by various local authorities to counteract the monopolistic tendencies of the Rhenish-Westphalian Co. in question. The Rhenish Schuckert Works Co. has in hand a large scheme for the supply of light and power in Bavaria, which is based upon the use of lignite as fuel, whilst brown coal is also to be utilised by the Leipsig Provincial Power Works Co. which has just been constituted at Kulkwitz, for supply in that district and in adjoining territory in Prussia and Saxony. The Rhenish Electricity Works (Lignite District) Co. has also been formed at Cologne for carrying into effect the contract recently concluded for the delivery of power to the city of Cologne, which will undertake, as hitherto, the distribution to the consumers in the town and vicinity.

Conduction of Electricity through Solid Silver Chloride.—Interesting observations which would seem to point to quite a novel order of phenomena have been recently made by Le Blanc and F. Kerschbaum (*Zeitschr. f. Elektrochemie*, No. 7, 1910), on the electrical conduction of solid silver chloride. Two platinum electrodes 49 mm.^{2} in area on each side were arranged in front of one another at 3 to 4 mm. distance, the intervening space being filled up with pure solidified silver chloride. On applying to the platinum leads a P.D. of 10 volts, a current of 3 to 4×10^{-7} amperes, corresponding to a resistance of several millions of ohms, was read on a sensitive galvanometer. Some time (one or two hours) afterwards, the galvanometer deflection increased, slowly at first, and then more and more rapidly, until the galvanometer had to be replaced by a milliampere-meter, while inserting an additional resistance of 93 ohms. The P.D. at the terminals fell to 2·1 volts, corresponding to a resistance of about 40 ohms, that is, one-millionth part of the initial resistance. If the initial P.D. is higher, the increase in conductivity is even more rapid. If then the chloride brought to this condition of good conductivity be tested with alternating current, it will at first show a conductivity practically equivalent to the figure observed in connection with direct current. Some time (mostly a few minutes) afterwards, its electrical resistance begins to increase again, and in most cases soon reaches an extremely high figure, corresponding to the original condition of the silver chloride. This would show the silver chloride again to have assumed its original properties, but for the fact that on applying a direct current, the high conductivity of the substance is re-established nearly instantaneously.

From this experiment it is seen that pure transparent silver chloride, that is, a typical salt under the influence of a slight drop in potential, shows a conductivity which finally assumes enormous figures, without there being any trace of decomposition. This condition may disappear most rapidly (as in the case of alternating-current experiments), but will be re-established nearly instantaneously as soon as the same direct P.D. is again applied. On leaving the substance to itself during the night, and again heating to a

temperature close to the melting point, these phenomena are found to remain entirely unaltered.

The experimenters propose to continue their experiments on silver chloride, and eventually to extend their work to other salts and salt mixtures; they thus hope to find an interval of temperatures within which electronic conductivity and electrolytic conductivity are capable of existing side by side.

The British Association.—The annual gathering of the British Association for the Advancement of Science will open at Sheffield on Wednesday evening next with the address of the president, Prof. T. G. Bonney, F.R.S. On Thursday morning the sectional addresses will be delivered as usual. Prof. Dalby will preside over the Engineering Section and Prof. E. W. Hobson over the Mathematical and Physical Science Section. Information has reached us concerning several other electrical papers beyond those already announced for reading.

Award.—The *Standard* states that Mr. W. H. Chatten, electrical fitter apprentice, of Sheerness Dockyard, who was recently awarded the first Admiralty scholarship in electrical engineering, tenable at the Royal Naval College, Greenwich, has been awarded by the Board of Education a Whitworth Exhibition of £50 as a result of the Science and Art Examinations held in May last.

Educational. — Technical College, Sunderland.—The day classes open on October 1st, and the evening courses in electrical engineering on September 22nd. Particulars can be obtained from the Secretary, Mr. W. T. Maccall, M.Sc., is head of the department of Electrical Engineering.

University College, London.—The handbook of the Faculty of Engineering for the forthcoming session has now been issued. Dr. J. A. Fleming, Dean of the Faculty, is at the head of the department of Electrical Engineering, with Mr. W. C. Clinton Assistant Professor, and Mr. H. M. Hobart will give special courses of lectures on Electrical Design. Full particulars of the various curricula, &c., can be obtained on application to the Provost.

Cricket.—The return cricket match between the Anchor Cable Athletic Club, Leigh, and the St. Helens Cable and Rubber Co., Ltd., took place at Warrington on Saturday last, and resulted in an easy win for the Anchor team by 57 runs to 32. A bowling match between teams representing the two companies was also played, the St. Helens team proving the victors by 15. The Anchor cricket team have this year won the Silver Challenge Cup and Medals of the Leigh and District Cricket League, Senior Division, whilst they are the present holders of the Cup of the Second Division of the same League.

Onewatt Lamps on the Continent.—The Siemens and Halske Co., of Berlin, announces that the manufacture of the new onewatt lamp, having a filament of wolfram, has now been taken up on a large scale by the glow-lamp factory. With the production of the tantalum lamp the factory reached the limit of its capacity, and a new site has had to be purchased adjoining the buildings in the Helmholtz Strasse. An extension of the glow-lamp factory has there been made, and the new lamp is now produced there.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—On 17th inst., at the York Electricity Works, in the absence of Mr. Hame, city electrical engineer, Mr. Turnbull, on behalf of the staff and the employés of the electricity and tramways department, presented Mr. W. E. Wright, on the occasion of his marriage, with a case of solid silver dessert spoons.

Tramway Officials.—At a meeting of the Huddersfield Town Council held on the 17th inst., the salary of Mr. R. H. Wilkinson, manager of the Tramways Department, was increased from £375 to £400 per annum.

Mr. J. H. Shepherd, manager of the Dunfermline and District Tramways, and late manager of the Dundee, Broughty Ferry and District Tramways, was on the occasion of his marriage, made the recipient of an electric standard lamp and silver cigarette case, along with a gold brooch for his bride. Mr. Nicolson, secretary of the Dunfermline and District Tramways, made the presentation.

General.—According to the *Review of the River Plate*, changes have recently been made in the United River Plate Telephone Co. Mr. J. E. Parker remains as general manager in the River Plate, Mr. S. G. Angel has been appointed secretary to the local board, and Mr. C. W. Gwyther, M.I.E.E., has been appointed manager for Buenos Ayres. "Mr. Gwyther joined the United Telephone Co. of London in 1884, and was appointed manager of the North Wales district for the National Telephone Co. in 1893, and manager in Dublin in 1895. In 1900 he was engaged by the United River Plate Telephone Co. as engineer for the construction of the underground system, being appointed chief engineer in 1903, and sub-manager in 1906."

The same contemporary recently stated that Mr. F. K. Cassels, M.I.E.E., was shortly to leave Buenos Ayres, accompanied by his family, to take up his residence in New Zealand.

According to the same exchange, Mr. Bernard F. Browne, manager and chief engineer of the Primitiva Gas and Electric Light Co., was last month made the recipient of a gold medal by the works employés, and of an album by the other employés, of the company. Mr. Browne joined the Primitiva Co. about eight years ago as engineer at the Retiro Works, and on the retirement of Mr. G. W. Anderson in 1906 became general manager and engineer, which post he held until the amalgamation of the three gas companies. He left for England early in July.

Mr. W. Vincent Waite, works manager of Messrs. Bruce Peebles & Co., Ltd., Edinburgh, has resigned his position and will shortly open offices in Cardiff for the purpose of starting an engineer's agency business, and will trade as W. V. Waite & Co., Ltd., whose temporary address is 24, Llanbleddian Gardens, Cathays, Cardiff.

On August 16th, at Leeds, Mr. Maurice Solomon, A.M.I.E.E., of Birmingham, was married to Christine Harriett, elder daughter of Mr. A. S. Davis, M.A., of Leeds.

A Welsh newspaper reports that Mr. Gwilym Dummer has been appointed mechanical and electrical engineer to the General Post Office, Manchester District. Mr. Dummer had for six years occupied a position in the electrical department of the Manchester Corporation.

Obituary.—The death has taken place at his residence at Cambuslang—after a short illness—of Mr. Alex. Crombie Taylor, manager of Messrs. Falk, Stadelmann & Co., Ltd., electric fittings manufacturers, Glasgow and London.

NEW COMPANIES REGISTERED.

Eclipse Trading Co., Ltd. (111,337).—This company was registered on August 16th, with a capital of £5,000 in £5 shares, to carry on the business of manufacturers of, and dealers in, films and apparatus capable of being used in electric or kinematograph shows or other public or private entertainments, &c., and to adopt an agreement with J. E. Morrell and E. H. Harmsworth. The subscribers (with one share each) are:—J. E. Morrell, 34, Thursley Street, Bradford, kinematograph film dealer; E. H. Harmsworth, 24, Silver Hill, Bradford Moor, Bradford, kinematograph expert. Private company. The number of directors is not to be less than two or more than five; the first are J. E. Morrell and E. H. Harmsworth; qualification, 25 shares. Registered office, 24, Church Bank Buildings, Bradford.

Taylor & Romany, Ltd. (111,359).—This company was registered on August 17th, with a capital of £2,000 in £1 shares, to take over the business of builders, furnishing ironmongers and locksmiths, bellhangers, gas and hot water fitters, hydraulic, electrical and mechanical engineers, manufacturers of and dealers in electric, magnetic, telegraphic, telephonic and other appliances, carried on as "Taylor & Romany." The subscribers (with one share each) are:—C. A. Taylor, 123, Lower Richmond Road, Putney, S.W., ironmonger; F. O. Romany, 123, Lower Richmond Road, Putney, S.W., ironmonger. Private company. The number of directors is not to be less than two or more than five; the first are C. A. Taylor and F. O. Romany; remuneration as fixed by the company. Registered office, 35, Little Pulteney Street, St. James', S.W.

Sireno Co., Ltd. (111,315).—This company was registered on August 13th, with a capital of £3,000 in £1 shares, to carry on the business of manufacturers of and dealers in electric warning signals, motor horns, projectors, switches, taximeters and all kinds of accessories, materials and things used in connection with motor cars, boats and aeroplanes. The subscribers (with one share each) are:—S. F. Tyler, 46, Brewer Street, W., merchant; G. H. Mansfield, 1, Broad Street Place, E.C., secretary. Private company. S. F. Tyler is the permanent governing director. Registered office, 46, Brewer Street, W.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

W. Lucy & Co., Ltd. (51,908).—Return dated July 4th, 1910. Capital £15,000 in £10 shares (250 pref. and 1,250 ordinary); 250 pref. and 1,030 ordinary shares taken up; £10 per share called up on 250 pref. and 781 ordinary; £10,310 paid; £2,490 considered as paid on 249 ordinary. Mortgages and charges: £7,000.

Llangollen and District Electric Light and Power Co., Ltd. (75,384).—Return dated July 16th, filed July 29th; capital £6,000 in £1 shares (2,500 preference); 1,754 ordinary and 360 preference shares taken up; £1 per share called up; £2,110 15s. paid, leaving £3 5s. in arrears. Mortgages and charges: £2,000.

Cleveland and Durham Electric Power, Ltd.—An issue on August 6th of £8,500 debentures, part of a series to secure £150,000, particulars of which have already been filed.

Van Raden & Co., Ltd. (78,383).—A memorandum of satisfaction in full on August 15th, 1910, of mortgage dated November 25th, 1903, securing £1,900, has been filed.

Jarrow and District Electric Traction Co., Ltd.—Particulars of £20,000 debentures, created August 3rd, 1910, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of present issue being £15,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees. A memorandum of satisfaction in full on August 10th, 1910, of debentures dated January 19th, 1909, securing £19,000, has also been notified.

County of London Electric Supply Co., Ltd. (34,320).—Issue on July 25th of £2,000 4½ per cent. debenture stock, part of a series of which particulars have already been filed.

CITY NOTES.

Nairobi Electric Power and Lighting Co., Ltd.

THE directors report that the accounts for the period up to December 31st, 1908, includes only the first few months of revenue-earning period, and of necessity the working expenses at Nairobi were considerably in excess of the receipts, making a net working loss of £1,234. The steady progress of the company's operations during 1909 has resulted in the receipts being slightly in excess of all the working expenses there. There has been considerable further expenditure on capital account, and this is still proceeding. During the present year further good progress has been made, as will be seen by the following figures:—

	At Dec. 31, 1908.	At Dec. 31, 1909.	At June 30, 1910.
Number of customers connected ..	—	178	228
Motors connected, B.H.P.	31	64	80
Lights connected, 8 C.P. equivalent ..	2,479	3,628	4,728
Street lighting „ „ ..	nil.	nil.	1,192

Numerous additional orders are in hand or being negotiated, and the directors anticipate that by the end of the present year the receipts will be more than sufficient to meet all working expenses at Nairobi and London, and debenture interest. The company's operations at Nairobi have continued under the same supervision and management, with Mr. R. C. Bayldon as managing director, and Mr. Chas. Udall as chief engineer, and the prospects for the immediate future appear to be very satisfactory. The company's Nairobi accounts have been audited on the spot by Mr. Ernest B. Gill, chartered accountant, with whom arrangements have been made for a monthly audit of the cash account, so that the directors and shareholders may be assured that the African accounts are in a satisfactory condition. Sir Stanley Edwards, K.C.B., the chairman of the company, offers himself for re-election.

British Continental Electricity Co., Ltd.

THE directors report that during the year ended April 30th, 1910, 171 new installations have been connected, while the number of lamps (8-C.P. equivalent) added, has been 1,205 (including motors). The output has increased, and the working expenses have been reduced. The extension of the network to the neighbouring village of Poggio, has now been carried out. After writing off £154 as depreciation in respect of furniture, tools, meters, &c., and £135 as depreciation of plant and stock, the balance standing to the credit of revenue account, including the sum brought forward, is £1,670, which is to be carried forward to meet the payment of future dividends, the amount having been temporarily appropriated on capital account, pending the issue of further capital. The sum of £372 has been spent on capital account during the year. Mr. E. E. Berry offers himself for re-election as a director.

The annual meeting is called for August 31st, at 82, Victoria Street, S.W., and at a subsequent extraordinary meeting, a resolution will be submitted altering one of the articles so as to authorise the directors to borrow up to £12,000 without the sanction of a general meeting.

Swiss Bank for Electrical Enterprises.

THE report of the Bank fur Elektrische Unternehmungen, of Zurich, which is one of the principal investment and promoting companies in Europe, and whose observations on the situation of the electrical industry in Europe were reproduced in a previous issue, states that the quotations of most of the institution's securities advanced during the year 1909-10, and the directors, therefore, took advantage of the opportunity to somewhat reduce the portfolio holdings by sales, and thereby obtain, in addition to the not inconsiderable profits, the means for proceeding with new transactions. Thus, the possession of various securities booked at £180,000 in the previous year had not only been decreased to £120,000, but the bank had also disposed, at a suitable profit, of large amounts in shares of different undertakings closely associated with it. On the other hand, the bank had exercised its preferential rights in regard to the issue of new shares by companies which raised their capital during the year, so that the total holding in these undertakings remained considerable. The investments in shares and founder parts had, consequently, risen from £2,620,000 to over £2,840,000. A new 4 per cent. loan of £200,000 was issued in April, 1910, for the purpose of further strengthening the funds of the bank. The money derived from this loan and from the before-mentioned sales of securities, in so far as it was not still available in the form of banking credit, had been employed partly for increasing existing interests and partly for entering upon new transactions in the shape of shares or in making advances. The accounts show the following figures for the past two years:—

	1909-10.	1908-9.
Share capital	£1,600,000	£1,600,000
Loan „	1,550,000	1,720,000
Gross profits	276,000	246,000
Net profits and balance forward	175,000	175,000
Dividend	160,000	160,000
„ per cent.	10	10

The profits realised on the disposal of securities from the standpoint of the rise in quotations were mainly devoted to reducing the book value of the new investments, which, together with those formerly acquired, were brought into the accounts at the nominal value, at the highest. The receipts from dividends and interest from participations, with only a moderate appropriation from the profits on sales, were sufficient to enable the payment of 10 per cent., as in each of the two preceding years.

Mexico Tramways Co., Ltd.—The annual meeting of this company was held at Toronto on 5th inst. The chairman said that Mexico had almost entirely recovered from the late dulness. There was every prospect of improvement in the receipts of the company. Great preparations were being made by the Government for the Centennial Celebrations in September. The Xocohimilco line was now in full operation, and the receipts were very satisfactory. The net revenue for 1909, in gold, after paying all expenses and fixed charges, amounted to $922,458, plus $371,350 standing to profit and loss at the end of the previous year. Four quarterly dividends at the rate of 6 per cent. per annum had been paid, $300,000 carried to reserve account, leaving $416,344·12 to be carried forward.

Liverpool District Lighting Co., Ltd.—Interim dividend for the past half-year at the rate of 4 per cent. per annum.

Aberdeen Suburban Tramways Co., Ltd.—The directors report that the profit earned for the past half-year amounts to £1,261, and that there is a balance of £2,532 at the credit of profit and loss account. The directors propose that the amount standing at the credit of profit and loss should be applied as follows:—In adding to the amount at the credit of the renewal and depreciation account, which will then be standing at £6,200, £1,200; in payment of dividend of 2½ per cent. for the past year on paid-up capital of the company, £781; in payment of directors' fees, £42; leaving to be carried forward £509.

Bolckow Vaughan & Co., Ltd.—In their report for the past year the directors state that their total expenditure upon new by-product ovens, exhaust steam turbines, electrical installations, new ironstone mine machinery, extensions, &c., during the year was £173,602, of which sum £142,634 has been debited to capital account.

South American Light and Power Co., Ltd.—The directors announce a dividend of 5 per cent. for the year ended March 31st, £1,500 being placed to reserve and £558 carried forward.

Stock Exchange Notices.—The Committee have ordered the undermentioned securities to be quoted in the Official List:—

Amazon Telegraph Co., Ltd.—£286,500 5 per cent. debentures of £100 each (Nos. 136 to 3,000), in lieu of the scrip, together with £13,500 5 per cent. debentures of £100 each (Nos. 1 to 135).

British Columbia Electric Railway Co., Ltd.—Further issue of £530,000 4½ per cent. perpetual consolidated debenture stock.

Continental.—The report of the Société Aynonyme Westinghouse states that the accounts show a profit of 829,852.65 fr. on working for the year to December 31st which, added to the balance of 86,427.76 fr. brought forward, makes an available surplus of 916,280.41 fr. The *Financier* states that after payment of debenture interest and transfers to reserve, a balance of 111,095.85 fr. is carried forward.

SWITZERLAND.—La Union Ottomane Société pour Entreprises Electriques en Orient, of Zurich, reports a profit of only £3,539 for the last financial year; this is being carried forward to next year, the dividend being passed.

Dublin and Lucan Electric Railway Co.—Mr. W. Mooney presided at the half-yearly meeting held at Dublin on August 17th, and stated that the receipts had increased by £110 to £3,462, the expenses having advanced by £95, of which £62 was for coal. After paying the 5 per cent. preference dividend there remained £612 to carry forward, as the board did not advise any allocation of the balance at present. The report was adopted.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight.		No. of wks.	Total to date.		Route miles open.	Inc.
		£*			£	£*		
Aberdeen	Aug. 17	3,367	— 277	11	17,237	— 354	..	..
Ayr	„ 20	1,079	+ 81	14	6,106	+ 293	8	..
Bath	„ 20	2,001	+ 18	33	26,726	+ 1,238	..	..
Belfast	„ 19	8,207	+ 439	20	81,669	+ 3,390	37	..
Birkenhead	„ 17	2,311	+ 84	20	22,836	+ 510	13·6	..
Birmingham Corp.	„ 18	13,276	— 698	19	129,737	+ 530	56·16	..
Blackburn	„ 17	2,183	— 152	20⅝	22,858	— 976	4·62	·12
Blackpool Corp.	„ 18	7,220	+ 959	..	30,718	+ 1,150	..	..
†Blackpool-Fleetw'd	„ 20	1,866	+ 200	7	11,744	+ 262	..	..
Bolton	„ 21	4,939	+ 54	21	4,212	— 317	26	..
Bournemouth	„ 17	4,913	— 192	19⅝	39,779	+ 3,812	21·9	..
†Bradford	„ 13	5,401	— 24	20	100,591	— 3,121	54·81	..
Brighton	„ 21	2,716	— 8	20⅝	21,851	— 61	9·5	..
Bristol	„ 19	12,468	— 538	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	Aug. 12	427	— 20	32	6,940	+ 61	3·65	..
Barnsley	„ 12	394	+ 39	32	5,489	+ 179	..	..
Barrow	„ 12	793	+ 189	32	8,606	+ 1,961	5·37	..
Cavehill	„ 12	241	— 55	32	2,975	+ 162	..	..
Devonport	„ 12	1,108	+ 216	32	13,475	+ 1,726	3·85	..
Gateshead	„ 12	2,146	+ 23	32	31,497	— 186	11·15	..
Gravesend	„ 12	586	— 3	32	6,694	+ 26	6·5	..
Greenock	„ 12	1,527	+ 90	32	19,971	+ 2,680	7·25	..
Hartlepool	„ 12	752	+ 57	32	7,844	+ 432	6·72	..
Kidderminster	„ 12	491	— 40	32	3,570	+ 104	..	..
‡Leamington	„ 12	490	— 64	32	5,292	— 254	..	..
Merthyr	„ 12	320	— 24	32	6,622	— 230	2·9	..
Metropolitan	„ 12	17,772	— 2,196	32	217,091	+41,486	22	..
Middleton	„ 12	780	— 80	32	10,121	— 651	8·5	..
Mid. Joint Com'tee	„ 12	13,338	+ 219	32	18,284	+ 1,918	..	..
Oldham—Ashton	„ 12	1,176	— 54	32	17,690	— 124	9·13	..
Peterborough	„ 12	318	— 10	32	3,681	— 59	5·31	..
Potteries	„ 12	3,516	— 192	32	55,795	— 619	29	..
Rothesay	„ 12	1,224	— 59	32	6,979	+ 134	2·75	..
Southport	„ 12	1,128	— 72	32	9,475	+ 158	8·17	..
S. Metropolitan	„ 12	2,215	— 116	32	26,305	+ 1,100	..	..
Swansea	„ 12	3,012	+ 266	32	34,521	+ 4,004	12·5	..
Tynemouth	„ 12	1,224	— 77	32	8,205	+ 404	3·75	..
Weston-s-Mare	„ 12	1,131	+ 166	32	4,580	— 47	3	..
‡Worcester	„ 12	835	— 84	32	8,997	+ 147	5·75	..
Wrexham	„ 12	232	— 18	32	3,100	— 3	..	..
Yorks. Wool. Dist.	„ 12	2,107	+ 55	32	31,394	+ 2,649	17	..
Miscellaneous	„ 12	624	+ 27	32	6,910	+ 319	..	..
Burnley	Aug. 20	2,670	— 45	..	..	..	..	..
Burton-on-Trent	„ 21	566	— 18	20	5,5 9	— 68	6·6	..
†Bury	„ 17	1,259	— 78	19⅞	24,3 3	— 455	22·5	..
Cardiff	„ 6	5,257	— 824	19	42,115	— 296	..	..
Carlisle	..	..	..	..	..	..	..	..
Chatham and Dist.	„ 18	1,969	— 176	33	27,723	+ 65	4·98	..
Cork	„ 18	1,094	— 44	33	16,078	+ 1,605	9·89	..
Croydon	„ 12	3,961	+ 67	..	33,283	+ 3,270	11½	..
Darlington	„ 20	417	+ 36	21	4,176	+ 241	..	..
†Darwen	„ 19	539	— 13	20	5,039	— 128	4·36	..
Dover	„ 30	517	+ 26	17	3,706	+ 46	..	..
Dublin	„ 19	12,191	— 343	..	43,154	+ 61	4·25	..
Dundee	„ 17	2,427	— 32	18⅝	16,494	+ 281	15·5	..
East Ham	„ 20	2,122	+ 50	20⅝	21,403	+ 446	8.52	..
Exeter	„ 19	763	— 25	20	6,779	— 677	..	..
Glasgow	„ 20	35,677	+ 684	..	204,158	+11,179	97·75	8·25
Hastings	„ 18	3,352	— 87	..	..	..	..	..
Huddersfield	„ 20	3,591	+ 46	20	38,297	+ 1,899	28·5	·5
Hull	„ 20	5,424	+ 109	20	54,935	+ 3,123	14·5	..
Ilkeston	„ 18	266	— 36	20	2,602	— 156	..	..
†Ipswich	„ 20	1,146	+ 71	20	9,247	+ 555	10·5	..
†Kilmarnock	„ 13	316	+ 13	13	2,094	+ 43	4·25	..
Lancashire United	„ 17	2,881	— 242	..	43,192	— 540	39	..
†Leeds	„ 13	6,911	— 252	19	138,664	+ 4,680	..	..
Leicester	..	..	..	..	..	..	..	..
†Leith	„ 18	702	— 113	12⅝	8,523	+ 28	8·72	2
Liverpool	„ 13	23,499	+ 801	32½	356,962	+13,153	113·5	6
‡L.C.C.	„ 10	86,312	+10,644	..	797,811	+108,817	136	12
London United	„ 20	14,742	— 669	..	211,663	+ 9,404	..	..
Lowestoft	..	..	..	..	..	..	..	..
Manchester	„ 20	30,504	— 148	20	315,522	+ 4,946	188	1
Newcastle	„ 20	7,706	+ 85	..	81,710	+ 912	14·5	..
†Newport	„ 13	709	+ 4	20	13,925	+ 502	14·5	..
Oldham	„ 21	3,730	— 57	21	39,769	— 1,059	23·75	..
Pontypridd	..	..	..	..	..	..	..	..
†Portsmouth	„ 18	3,018	— 195	19	41,850	— 2,007	15·25	..
†Preston	„ 10	862	+ 65	19	14,123	— 800	..	..
Rotherham	..	..	..	..	..	..	..	..
†Salford	„ 15	9,653	— 70	19⅛	92,525	+ 808	..	..
Sheffield	„ 23	11,827	+ 985	11⅞	127,359	+ 7,483	39·8	·8
Southampton	„ 17	2,529	— 50	20	22,453	+ 496	..	..
Southend-on-Sea	„ 17	2,131	+ 224	20	13,105	+ 1,118	..	..
South Shields	„ 20	1,406	+ 34	20⅞	11,830	— 88	..	..
Swindon	„ 17	345	— 8	..	2,853	+ 119	..	..
Tyneside	„ 17	1,090	+ 82	7	3,679	+ 288	..	..
Wallasey	„ 18	2,455	+ 70	19⅞	18,969	— 112	..	..
Walthamstow	„ 20	1,551	— 23	20	15,296	+ 922	9	..
West Ham	„ 11	5,420	+ 268	19	47,692	+ 1,901	15·25	..
Wolverhampton	„ 17	2,063	+ 868	20	19,313	+ 2,721	14·25	1·75
Cen. London Rly.	„ 20	9,459	+ 684	7	87,185	+ 2,230	6·22	..
City & S. Lon. Rly.	„ 21	5,961	— 87	7	21,491	+ 7	7·26	..
Dublin-Lucan Rly.	„ 19	359	— 21	7	1,259	+ 45	7	..
G.N. and City Rly.	„ 20	2,470	+ 103	7	8,972	+ 254	3·5	..
L'pool Overh'd Rly.	„ 20	3,018	— 85	..	11,987	+ 2	6·8	4·2
Llandudno-Col. Bay	„ 12	1,705	+ 19	36⅝	9,236	+ 5	..	..
London Elec. Ry. Co.	„ 20	20,696	+ 300	7	81,555	+ 610	21·25	..
Mersey Railway	„ 20	3,717	+ 59	7	13,668	+ 198	4·5	..
Metropolitan Rly.	„ 21	31,344	+1,409	..	116,243	+ 4,045	24·5	..
Met. District Rly.	„ 20	18,093	+1,301	7	71,399	+ 4,885	24	..
Anglo-Argentine	„ 19	68,901	+10,572	..	1,455,580	+170,933	..	..
§Auckland	July	14,747	+1,412	..	..	..	33	·7
Bombay (B.E.T.)	July 22	5,301	+ 703	29	78,562	+ 5,796	..	..
§Brisbane	July	18,115	+1,975	30	122,845	+14,018	..	..
§Brit. Columbia Rly.	..	..	..	..	..	..	..	..
Calcutta	Aug. 20	7,188	+ 565	..	..	..	..	..
§Cape Electric T.Ld.	..	..	..	..	..	..	..	..
§Kalgoorlie, W.A.	July	3,455	..	..	24,026	..	20·5	..
Madras	Aug. 15	1,364	+ 85	..	20,170	+ 1,226	..	..
Montevideo	July	20,614	+2,977	..	218,869	+19,719	..	..
§Lisbon	..	..	..	..	..	..	..	..
†Perth (W.A.)	July 15	1,520	+ 149	..	48,278	+ 8,571	29	1

* Compared with the corresponding period of 1909. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Evening.

Weary as must be the readers of these notes of hearing that there is nothing doing in the Stock Exchange markets, the inexorable law of necessity forces the repetition of the tedious truth. Investment business has dragged itself into a condition bordering on full-stop; and were it not for the remembrance of the public's home-coming next month, the luckless Stock Exchange member would feel inclined to retire from the unequal struggle with Fate, and live upon the little which he managed to snatch from the wrack of the boom in rubber shares.

Reference has been made here, on several occasions of late, to the steadiness of prices in the bonds of the Canadian-Mexican group. Even when the shares were so limp a market in consequence of the "Pearson incident" in New York, the prior-charge securities maintained a firm front, and a brief table may be of use to those who are attracted by this firmness of the prices. Without making any allowance for redemption, the yields of a representative group work out as follows at the current prices:—

Bond.	Interest.	Payable.	Price.	Yield per cent.
Elec. Dev. of Ontario	5	1st Mar.-Sept.	86½	£5 15 7
Kaministiqua Power	5	1st Jan.-July	101½	4 18 6
Mex. Electric Light Co.	5	Ditto	85½	5 17 4
Mexican Light and Power	5	1st Feb.-Aug.	93½	5 6 11
Monterey Ry. Lt. & P. (stk.)	5	Jan.-July	91½	5 9 0
Northern Light and Power	5	May-Nov.	85	5 17 8
Shawinigan Water	5	1st Jan.-July	109	4 11 9
Ditto Perp. Stock	4½	May-Nov.	102	4 8 3
Vera Cruz Elec. Lt. Power	5	Jan.-July	91½	5 9 3

Examples from the Tramways issues can be seen from this table:—

Bond.	Interest.	Payable.	Price.	Yield per cent.
Manaos Trams and Light	5	1st Jan.-July	87½	£5 14 0
Mexico Trams Gen. Con.	5	1st Mar.-Sept.	100	5 0 0
Ditto Mort.	6	1st Jan.-July	98	6 2 5
Para Elec. Rlys. Deb. Stock	5	May-Nov.	97	5 3 1
Rio Trams 1st Mortgage	5	1st Jan.-July	98½	5 1 6
Ditto Mortgage	5	1st April-Oct.	90	5 11 1
Sao Paulo 1st Mortgage	5	1st June-Dec.	102	4 18 0

It must, of course, be added that in the event of a purchase being contemplated, the prospective buyer should make full inquiries as to the date, price and probability of redemption in each case. A good many of the above issues are quoted weekly in our own price lists, and in most of them there exists a moderately free market.

The Mexican Light and Power and the Mexico Tramways varieties are firm, but the list of Metropolitan Companies' shares is disposed to weakness. Westminsters have fallen 5s., because of the successful competition of the Gas Light and Coke Company in the City of Westminster's area, a matter to which allusion was made here last week. City of London Ordinary weakened a little, but Metropolitans have hardened.

Much the same sort of dulness prevails in the Home Railway department. Metropolitan Consolidated is down ¼, and Districts fell ½. Central Londons are quiet: City and South London continues dull. The dividend declarations, reports and meetings being over, there is, in Stock Exchange parlance, "nothing to go for," and until the public come along with buying orders, the market will have to remain in its rut of depression. Underground Electric Railway bonds, in all three classes, show gains, the company's report being read as decidedly satisfactory.

The Telegraph and Telephone section is the best in the Stock Exchange. There are numbers of small rises down the catalogue, in which the foreign telephone issues are decidedly to the front. There are advances in both classes of shares in the Monte Video, United River Plate and the Oriental Telephone Companies. There are rises in Western Telegraph shares and Debenture stock, Eastern Extension Debenture and similar securities. With these have come advances in Telegraph Constructions and Henleys, both as regards the shares and Debenture stocks. These movements reflect the steady investment absorption of the past several weeks. The dealers have gone on selling stock without any coming in, and at last, in desperation, they have put up prices with a view to attracting sellers, if possible.

Fresh improvements in Anglo-Argentine Trams and British Columbia Preference are the features in the traction market. For some time past the demand for British Columbia stocks has been very quiet and very persistent. It needed but a slight pressure of open buying to put prices up substantially. In the industrial list, there is not much doing, Castner-Kellners being the principal performers with a rise of 3s. 9d., completely throwing off the slight relapse of last week. Rubber shares are a steady and a fairly good market, the auction sales of to-day (Tuesday) being rather disappointing to those who expected prices to show a dramatic rise, but gratifying enough to others who prefer to see quietude in the price of the raw material.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1906.	1907.	1908.	1909.	Closing Quotations Aug. 16th.	Closing Quotations Aug. 23rd.	Business done week ended Aug. 23rd, 1910. Highest	Lowest.	Rise + or Fall —	Present Yield per cent.
		*										£ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	3⅜ — 3⅞	3⅜ — 3⅞	..	..	..	Nil.
286,500	Do. 5 % Deb. Red. Iss. at 98 % script all paid	Stock	5 %	5 %	5 %	5 %	95 — 97	95 — 97	..	..	..	4 17 7
$255,196,000	American Telephone & Telegraph, Cap Stock ..	$100	8 %	8 %	8 %	8 %	136 —139	137 —140	..	..	+1	5 14 4
$ 53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	93 — 95	93 — 95	..	..	..	4 4 3
558,460	Anglo-American Telegraph	Stock	3⅞%	3½%	£3 4s.	3⅜%	64⅛— 66⅛	64⅛— 66⅛	64⅜	64⅛	..	5 9 10
3,220,770	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	106½—108½	106½—108½	107½	106⅜	..	5 10 7
3,220,770	Do. do. do. Deferred	Stock	1¾%	1 %	8/-	25/-	25⅝—26⅛	25⅝—26⅛	26	25⅝	..	4 15 3
47,725	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	101½—103½	101½—103½	..	..	..	4 16 7
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	8 %	9⅛ — 9⅜	9⅛ — 9⅜	9⅛	..	..	4 3 1
2,449,176	Commercial Cable, Stlng. 500 year 4% Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	84 — 86	84 — 86	..	..	..	4 13 0
16,000	Cuba Telegraph	10	5 %	6 %	6 %	6 %	8¾ — 9	8¾ — 9	8⅝	..	..	6 13 4
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½ — 17½	16½ — 17½	..	..	..	5 15 11
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3½ — 3¾	3½ — 3¾	..	..	..	5 14 3
6,000	Do. do. 10 % Cum. Pref. ..	10	10 %	10 %	10 %	10 %	7⅞ — 8¼	7⅞ — 8¼	..	..	..	6 1 3
6,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	99 —101	99 —101	..	..	..	4 9 1
60,710	Direct United States Cable	20	4⅝%	4⅝%	4⅝%	4⅝%	14⅝ — 15⅛	14⅝ — 15⅛	..	..	..	5 6 8
36,000	Direct W. India Cable, 4½% Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	99 —101	99 —101	..	..	..	4 9 1
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	132 —135	132 —135	134	132½	..	5 3 8
2,000,000	Do. 3½ % Pref. Stock..	100	3½%	3½%	3½%	3½%	84 — 86	84 — 86	85½	..	..	4 1 5
300,000	Do. 4 % Mort. Deb. Stock Red. ..	Stock	4 %	4 %	4 %	4 %	102½—104½	102½—104½	..	..	..	3 16 7
1,896,706	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	12⅜ — 12⅞	12⅜ — 12⅞	12⅞	12⅞	..	5 8 9
300,000	Do. 4 % Deb. Stock..	Stock	4 %	4 %	4 %	4 %	99 —102	99½—102½	101	..	+ ½	3 18 1
752,400	East. & S. Afric. Tel., 4 % Mt. Db. Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
200,000	Globe Telegraph and Trust	10	5½%	5½%	5½%	5½%	10⅛ — 10⅜	10⅛ — 10⅜	10⅜	10⅜	..	5 10 3
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13 — 13½	13 — 13½	13⅛	13⅛	..	4 8 11
181,127	Great Northern Telegraph, of Copenhagen..	10	20 %	20 %	18 %	..	29½ — 30½	29½ — 30½	30⅛	30⅛	..	6 3 0
150,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	53 — 55	53 — 55	53	..	..	6 15 8
17,000	Mackay Companies Common	$100	3½%	4 %	4 %	4½%	84 — 88	84 — 88	..	..	..	4 16 7
$41,380,400	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	74 — 78	74 — 78	..	..	..	5 2 7
$50,000,000	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	15/9	15/9	..	..	..	Nil
394,190	Monte Video Telephone Co., Ltd. Ord.	1	6 %	6 %	6 %	6 %	..	..	..	..	+ 1/32	6 4 8
72,680	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	..	..	17/6	..	+ 1/16	5 3 11
86,492	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	104 —105½ xd	104 —105½	104½	104	..	5 13 9
2,225,000	Do. do. Def. Stock	100	5 %	6 %	6 %	6 %	123¾—124½ xd	123½—125½	124½	123½	+ ½	4 15 7
3,725,000	Do. do. 6 % Cum. 1st Pref.	10	6 %	6 %	6 %	6 %	10 — 10⅜ xd	10 — 10⅜	..	..	..	5 11 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	5 %	6 %	6 %	6 %	10 — 10⅜ xd	10 — 10⅜	..	..	..	5 11 8
15,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅜ — 5⅝ xd	5⅜ — 5⅝	..	..	..	4 10 11
250,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	97⅞ — 99⅛	97⅞ — 99⅛	97⅞	..	..	3 10 4
2,000,000	Do. do. 4 % Deb. Stock Red... ..	100	4 %	4 %	4 %	4 %	98½—100⅜	98½—100⅜	..	..	..	4 0 0
1,983,593	Oriental Telep. and Elec. 1 to 171,504, fully paid..	1	7 %	8 %	8 %	8 %	1 1/16— 1 1/8	1 1/16— 1 1/8	30/-	..	..	4 18 6
179,313	Do. do. do. 6 % Cum. Pref. ..	1	6 %	6 %	6 %	6 %	1 1/16— 1 1/8	1 1/16— 1 1/8	..	..	+ 1/16	4 7 3
50,000	Do. do. do. 4 % Red. Deb. Stock..	100	4 %	4 %	4 %	4 %	86 — 88	86 — 88	86⅞	..	..	4 10 11
195,955	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	100	4 %	4 %	4 %	4 %	96½— 98½	96½— 98½	..	..	..	4 1 3
99,400	Reuter's	8	5 %	5 %	5 %	5 %	7⅞ — 8	7⅞ — 8¼	..	..	+ ⅛	4 18 9
11,839	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	98 —100	98 —100	99⅛	..	..	4 10 0
145,955	Submarine Cables Trust..	Cert.	6 %	6 %	6 %	..	129 —132	130—133	..	..	+1	4 10 3
3,042	United River Plate Telephone	5	8 %	8 %	8 %	8 %	6⅞ — 7⅛	6⅞ — 7⅛	7	6 31/32	..	5 12 3
120,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5⅛ — 5⅜	5 1/16— 5 1/8	..	..	+ 1/16	4 11 11
40,000	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2½	2½%	2½%	2½%	..	1⅛ — 1⅜	1 1/16— 1 1/8	..	..	..	4 10 11
30,008	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	96½ — 98½	96½ — 98½	..	..	..	4 1 3
150,000	Western Telegraph, Ltd., Nos. 1 to 207,930 ..	10	7 %	7 %	7 %	7 %	13½ — 14½	13⅝ — 14⅝	13⅞	..	+ ⅛	4 17 5
207,930	Do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	99 —101	100—102	..	..	+1	3 18 5
800,000	Do. do. 5 % Perp. Deb. Stock ..	Stock	Nil	Nil	Nil	Nil	1/16— 1/8	1/16— 1/8	..	..	..	Nil
88,321	West India and Panama Telegraph	10	8 %	6 %	6 %	6 %	8½ — 9	8¼ — 9	..	..	..	6 13 4
34,563	Do. do. 6 % Cum. 1st Pref.	10	Nil	£2 6	15 %	14½%	8 — 9	8 — 9	..	..	..	16 12 9
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	£2 6	15 %	14½%	8 — 9	8 — 9	..	..	..	4 18 0
80,000	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	99½—101½	100—102	..	..	+ ½	

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

640,000	Anglo-Argentine Trams, 5% Cum. 1st Pref. 1 to 640,000	5	..	..	..	5 %	4⅛— 4⅜	4 7/16— 4 11/16	92/6	90/-	+ 1/16	5 6 8
500,000	Do. 5 % 2nd Pref., 800,000 to 1,300,000	5	..	..	..	5 %	4¼— 4⅜	4¼— 4⅜	..	..	..	5 14 3
4,465,674	Do. 4 % Deb. Stock	Stock	..	..	4 %	4 %	90 — 91½	90½— 92	91⅛	91	+ ⅛	4 7 0
332,387	Auckland E. Trams, 5 % 1st Mort Deb. Stock ..	100	5 %	5 %	5 %	5 %	103 —105	103 —105	..	..	..	4 15 3
880,000	Babcock & Wilcox, 1 to 880,000	1	20 %	20 %	20 %	24 %	5⅜ — 5⅝	5⅜ — 5⅝	5 1/16	..	..	4 7 8
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 7/16— 1 9/16	1 7/16— 1 9/16	..	..	..	3 19 0
1,000,000	British Aluminium 5 % Mort. Debs. Red.	100	..	..	..	..	..	..	..	..	..	5 9 7
500,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	8 %	8 %	8 %	144 —148	144 —148	148	145½	..	5 8 1
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	6 %	6 %	124 —128	124 —128	125½	..	..	4 18 9
400,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	109 —112	109½—112½	112½	111⅜	+ ½	4 8 11
400,000	Do. 4½ % 1st Mort. Deb., 1 to 6,250	40	4½%	4½%	4½%	4½%	102 —104	102 —104	102⅜	102⅜	..	4 6 7
283,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	100 —103	100 —103	101⅜	..	..	4 7 5
212,600	British Electric Traction	10	Nil	Nil	Nil	Nil	1/16— 1/8	1/16— 1	..	..	..	Nil
133,301	Do. do. 6 % Cum. Pref.	10	6 %	3 %	1½%	Nil	2⅜ — 3⅛	2⅜ — 3⅛	..	..	..	Nil
161,437	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	86 — 90	86 — 90	..	..	..	5 11 1
1,473,653	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	68 — 73	68 — 73	..	..	..	6 3 3
528,236	British Insulated and Helsby Cables	5	10 %	10 %	10 %	10 %	6⅜ — 7⅛	6⅜ — 7⅛	..	..	..	6 17 11
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	5⅞ — 6⅛	5⅞ — 6⅛	..	..	..	4 12 4
100,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
500,000	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	101 —104	100 —103	..	..	—1	4 7 5
204,940	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 75,000	5	Nil	Nil	Nil	Nil	3/16— 2/16	3/16— 2/16	..	..	..	Nil
400,000	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	61 — 63	61 — 63	..	..	..	6 7 0
1,316,353	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	Nil	2/16— 1/8	2/16— 1/8	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
50,000	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	Nil	Nil	Nil	Nil	0 — 1/8	0 — 1/8	..	..	..	Nil
140,976	Do. do. Non-cum. 6 % Pref... ..	2	Nil	Nil	Nil	Nil	0 — 1/8	0 — 1/8	..	..	..	Nil
200,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	39 — 44	39 — 44	..	..	..	10 4
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	23 — 27	23 — 27	..	..	..	16 13 3
125,000	Calcutta Trams, 1 to 137,610	5	8 %	6 %	4½%	4½%	4 — 4½	4 — 4½	..	..	..	5 0 0
137,610	Do. 5 % Cum. Pref., Nos. 1 to 29,330..	5	5 %	5 %	5 %	5 %	4 1/16— 4 3/16	4 1/16— 4 3/16	98/9	..	..	5 1 3
45,304	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	96 — 99	96 — 99	..	..	..	4 10 11
350,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	10 %	9 — 10	9 — 10	..	..	..	5 0 0
35,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	4⅞ — 5⅛	4⅞ — 5⅛	..	..	..	4 15 3
40,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	100½—102½	100½—102½	..	..	..	4 7 10
300,000	Cape E. Trams., 1 to 491,222	1	Nil	Nil	Nil	Nil	2/16— 3/16	2/16— 3/16	..	..	..	Nil
491,222	Castner-Kellner Alkali, 1 to 450,000	1	8 %	12 %	12½%	12½%	2⅝ — 2¾	2 13/16— 2 15/16	59/-	56/6	+ ½	4 5 6
450,000	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4 %	4½%	104 —107	104 —107	..	..	..	4 4 1
210,158	Central London Railway, Ord. Stock	Stock	4 %	3 %	3½%	3 %	64 — 66 xd	64 — 66	64½	..	..	4 10 11
1,890,690	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	84 — 86 xd	84 — 86	..	..	..	4 13 0
554,655	Do. do. Def. do.	Stock	4 %	2 %	2½%	2 %	49 — 51	49 — 51	..	..	..	3 18 5
554,655	City and South London Railway	Stock	2½%	2½%	1½%	1⅝%	27 — 28	27 — 28	27⅞	..	..	6 5 0
1,480,000	Crompton & Co., Nos. 1 to 85,000	8	5 %	5 %	Nil	Nil	¼ — ⅜	¼ — ⅜	..	..	..	Nil
85,000	Do. 5 % 1st Mort. Reg. Debs., 900 of £100, and 901 11,000 of £50 Red	..	5 %	5 %	5 %	5 %	84 — 87	84— 87	..	..	..	5 14 11
100,000												

* Unless otherwise stated, all shares are fully paid.

‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued.*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years.				Closing Quotations Aug. 16th.	Closing Quotations Aug. 23rd.	Business done week ended Aug. 23rd, 1910.		Rise + or Fall —	Present Yield per cent.
			1906.	1907.	1908.	1909.			Highest	Lowest		£ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	6 %	6 %	1 — 1⅛	1 — 1⅛	..	..	..	5 6 8
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 — 1⅛	1 — 1⅛	..	..	..	5 6 8
271,080	Do. do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	98 —101	98 —101	..	..	..	4 9 1
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	10	6 %	6 %	6 %	6 %	12⅜ — 13⅜xd	12⅜ — 13⅜	..	..	..	4 7 3
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	4½ %	2½ %	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
17,139	Do. "A" shares, 01—017,139	5	4½ %	2½ %	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
307,895	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	63 — 68	63 — 68	..	..	..	5 17 8
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	79 — 82	79 — 82	..	..	..	6 1 11
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	1/32 — 1/16	1/32 — 1/16	..	..	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	7 %	1 1/32 — 1 1/16	1 1/32 — 1 1/16	..	..	..	9 6 8
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	7 7/8 — 8	7 7/8 — 8	..	..	..	6 5 0
200,000	Do. do. 4 % Mort. Deb.	Stock	4 %	4 %	4 %	4 %	82 — 86	82 — 86	..	..	..	4 13 0
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	2 %	Nil	Nil	3/32 — 1	3/32 — 1	..	..	..	Nil
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	7 %	10¼ — 10⅜	10¼ — 10⅜	..	..	..	6 10 3
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103½	102 —103½	..	..	..	4 16 10
40,000	Henley's (W.T.), Telegraph Works, Ord.	5	15 %	15 %	15 %	15 %	12 — 12⅝	12⅜ — 12⅝	..	..	+ ⅛	5 16 6
40,000	Do. do. 4½ % Pref.	5	4½ %	4½ %	4½ %	4½ %	5 — 5⅛	5 — 5⅛	5⅛	..	..	4 5 9
150,000	Do. do. 4½ % Mort. Deb Stock	Stock	4½ %	4½ %	4½ %	4½ %	105 —107	105½ —107½	..	..	+ ⅜	4 3:9
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	10 %	10 %	10 %	10 %	14½ — 15½	14½ — 15	..	..	— ½	6 13 4
37,500	†Liverpool Overhead Railway, Ord.	10	Nil	⅛ %	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	4½ — 5½xd	5 — 5⅝	..	..	..	9 10 6
600,070	London United Trams. (1901) 1 to 50,007	10	3 %	3 %	Nil	..	1½ — 2⅛	1½ — 2⅛	..	..	..	Nil
399,930	Do. do. 60,008 to 100,000	10	3 %	3 %	Nil	..	1½ — 2⅛	1½ — 2⅛	..	..	..	Nil
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	3⅜ %	..	2 — 2⅛	2 — 2⅛	..	..	..	15 0 0
1,649,930	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	67 — 71	67 — 71	..	..	..	5 12 8
5,732,062	Metropolitan Consolidated	100	1 %	⅛%	⅛%	1 %	38½ — 38⅝	38 — 38½	38½	38	— ¼	2 12 0
2,640,914	Do. Surplus Lands	100	2⅜%	2⅜%	2⅜%	2⅜%	65 — 67	65 — 67	65⅛	63⅜	..	4 2 1
3,235,000	Do. District	100	Nil	Nil	Nil	Nil	21— 21⅛	20⅞ —21	21 7/16	20⅜	— ⅛	Nil
391,337	Metropolitan Electric Trams., Ord.	1	..	..	4½%	5%	3/32 — 1/16	3/32 — 1/16	..	..	..	5 15 0
314,016	Do. do. Defd.	1	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	1/8	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	3/32 — 1/16xd	3/32 — 1/16	15/9	15/6	..	5 11 3
595,600	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	96 — 99	96 — 99	98½	96½	..	4 10 11
$10,823,200	Mexico Trams Co., Common Stock	..	..	..	..	6 %	119 —121	119 —121	119⅝	119	..	4 19 2
$9,000,000	Do. 1st Mort. 50-year 5 % Gld. Bds.	..	..	..	..	5 %	99 —100	99⅛ —100½	100⅛	99⅝	+ ½	4 19 6
245,500	Potteries Electric Traction	1	4 %	4 %	Nil	..	3/32 — 1/16	3/32 — 1/16	..	..	..	..
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	3/32 — 1/16xd	3/32 — 1/16	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	82 — 85	82 — 85	..	..	..	5 3 6
37,350	Telegraph Construction and Maintenance	12	15 %	17½%	15 %	17½%	33½ — 35½	34 — 36	35	34	+ ½	5 16 8
140,000‡	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	99½ —101½	100 —102	..	..	+ ½	3 18 5
1,000,000	Underground Electric Railway, 5 % Prior Lien	..	..	..	5 %	..	102⅛ —103⅛	103 —104	..	..	+ ⅛	4 16 2
2,800,000	Do. do. 4½ % Bonds	..	..	..	4½%	4½%	88 — 90	89 — 91	90½	89½	+1	4 18 11
4,900,000	Do. do. 6 % Income Bonds	..	..	..	..	..	38 — 40	39 — 41	40⅜	40	+1	..
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	10 %	5 %	Nil	3/32 — 1/16	3/32 — 1/16	..	..	..	..
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	..	6 %	6 %	3 %	1¼ — 1⅜	1¼ — 1⅜	..	..	..	8 11 5
245,495	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	60 — 70	60 — 70	..	..	..	5 14 4

ELECTRICITY SUPPLY COMPANIES.

30,449	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10%	10 %	10 %	10 %	6⅞ — 7⅛xd	6⅞ — 7⅛	..	..	..	6 15 7
9,551	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	6 13/16 — 7 5/16xd	6 13/16 — 7 5/16	..	..	..	4 15 9
400,000	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 —102	99 —102	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	3⅜ — 3⅞xd	3⅜ — 3⅞	70/-	..	..	6 9 0
80,000	Do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅛ — 4⅜xd	4⅛ — 4⅜	..	..	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅝ — 4⅛	3⅝ — 4⅛	80/-	..	..	4 17 0
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	97 — 99	97 — 99	..	..	..	4 2 6
49,436	Chelsea Electricity Supply, Ord.	5	4½%	4½%	4½%	4½%	3¾ — 4¼	3¾ — 4¼	..	..	..	5 5 11
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	99 —101	99 —101	99⅜	..	..	4 9 1
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	7 %	11¼ — 11⅜	11¼ — 11⅜	11⅜	..	— ⅛	6 0 5
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11⅜ — 12¼	11⅜ — 12¼	..	..	..	4 19 0
400,000	Do. 5 % Db. Stk.	Stock	5 %	5 %	5 %	5 %	120 —124	120 —124	..	..	..	4 0 8
800,000	Do. 4½ % 2nd. Db. Stk.	100	4½%	4½%	4½%	4½%	99½ —102½	99½ —102½	..	..	..	4 7 10
50,000	County of Durham Electrical Power, Ord.	5	4 %	2 %	Nil	Nil	1⅝ — 2	1⅝ — 2	..	..	..	Nil
50,000	Do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	2⅞ — 3¼	2⅞ — 3¼	..	..	..	7 13 10
250,000	Do. do. 5 % 1st Mtg. Deb.	Stock	..	..	5 %	5 %	94⅜ — 96⅞	94⅜ — 96⅞	..	..	..	5 3 8
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	7⅝ — 7⅞	7⅝ — 7⅞	7 11/16	7 7/8	..	6 7 0
55,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅝ — 11	10⅝ — 11	10 15/16	..	..	5 9 1
400,000‡	Do. do. 4½ % Deb. Stock	Stock	4½%	4½%	4½%	4½%	104 —107	104 —107	..	..	..	4 4 1
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	101⅛	101⅝	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	3 %	Nil	Nil	Nil	1¼ — 1⅜	1¼ — 1⅜	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	75 — 78	75 — 78	..	..	..	5 15 5
$8,150,000	Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds.	$500	..	..	5 %	5 %	85 — 88	85 — 88	86	..	..	5 8 8
10,000	Folkestone, 1 to 10,000	5	5⅝%	5⅝%	5⅝%	5⅝%	4¼ — 4⅜	4¼ — 4⅜	..	..	..	5 15 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	99 —102xd	99 —102	..	..	..	4 8 3
15,000	Hove, 1 to 15,000	5	9 %	8½%	8½%	8½%	7 — 7½	7 — 7½	6⅞	..	..	5 13 4
$1,376,000	Kaministiquia Power Co., 5 % Gold Bnds.	100	..	..	5 %	5 %	100½ —102½	100½ —102½	..	..	..	4 17 7
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	8 %	8 %	6⅞ — 7⅛xd	6⅞ — 7⅛	..	..	..	5 10 4
90,000	Do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	93 — 95	93 — 95	..	..	..	4 4 3
11,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	2½%	3 %	..	1⅝ — 2	1⅝ — 2	..	..	..	4 8 11
70,000	Do. do. do. 6 % Pref.	5	6 %	6 %	6 %	..	5 1/16 — 5 5/16	5 1/16 — 5 5/16	..	..	..	5 12 11
382,355	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4½ %	4½%	4 %	4 %	90 — 92	90 — 92	..	..	..	4 7 7
200,000	Metropolitan Electric Supply, 1 to 100,000	5	8 %	6½%	5 %	5 %	3⅛ — 3⅜xd	3⅛ — 3⅜	..	..	..	7 8 2
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4 — 4½	4 — 4½	..	..	..	5 0 0
235,000	Do. 4½ % 1st Mort. Deben. Stock	Stock	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
248,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	82 — 85	82 — 85	..	..	..	4 2 4
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	100	5 %	5 %	5 %	5 %	85 — 86	84½ — 85½	85½	..	— ½	5 16 7
13,585,000	Do. Light and Power Co., Ltd., Common	$100	..	4 %	3½%	4 %	78 — 80	79 — 81	80½	79½	+1	4 18 9
$2,400,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	7 %	7 %	103 —105	103½ —105½	105¼	104	+ ⅜	6 12 8
12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	100	..	..	5 %	5 %	93 — 94	93½ — 94½	94	93⅝	+ ½	5 6 1
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	95½ — 97½	95⅝ — 97⅞	..	..	..	4 12 4
130,491	Newcastle-on-Tyne, 1 to 137,500	5	8 %	8 %	2½%	..	3⅜ — 4⅛	3⅜ — 4⅛	..	..	..	2 19 0
137,500	Do. 5 % Pref., 1 to 137,500	5	5 %	5 %	5 %	5 %	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	5 5 3
150,000	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,500	100	..	..	..	5 %	100 —102	100 —102	..	..	..	4 18 0
10,352	Notting Hill Electric Lighting	10	7½%	7½%	7 %	..	12 — 13	12 — 13	..	..	..	5 7 8
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	6⅝ — 6⅞	6⅝ — 7⅛	..	..	..	5 1 10
119,694	River Plate Elcty. Co. Ord.	Stock	2½%	6 %	8 %	9 %	210—225	210—225	..	..	..	4 0 4
100,000	Do. do. 6% Non Cum. Pref.	Stock	6 %	6 %	6 %	6 %	105—115	105—115	..	..	..	5 4 4
200,000	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	100½ —102½	100½ —102½	..	..	..	4 17 7
40,000	St. James' and Pall Mall Electric Light, Ord.	5	10 %	10 %	10 %	10 %	7⅞ — 8⅛	7⅞ — 8⅛	7⅞	..	..	6 1 3
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	4 16 7
150,000‡	Do. do. 3½ % Deb. Stock Red.	100	3½%	3½%	3½%	3½%	84 — 86	84 —101	..	..	..	4 1 5
12,000	Smithfield Markets Electric Supply, Ord.	5	Nil	Nil	Nil	..	1⅝ — 2	1⅝ — 2	..	..	..	Nil
65,000	South London Electric Supply, Ord.	4	3 %	4 %	5 %	5 %	2⅝ — 2⅞	2⅝ — 2⅞	..	..	..	6 15 7
130,100	Do. do. 5 % 1st Mort. Deb.	100	..	..	5 %	5 %	99 —102	99 —102	101	..	..	4 18 0
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	..	3/32 — 1/16	3/32 — 1/16	..	..	..	6 13
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1/16 — 1 1/16	1/16 — 1 1/16	..	..	..	6 11 9
224,520	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	¾ — 1	¾ — 1	..	..	..	20 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	2 — 2⅛	2 — 2⅛	..	..	..	10 0 0
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	79 — 81	79 — 81	..	..	..	5 11 1
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 808,000	1	..	..	5 %	..	3/32 — 1/16	3/32 — 1/16	..	..	..	5 14 3
100,000	Westminster Electric Supply, Ord.	5	12 %	10 %	10 %	10 %	8⅝ — 8¾	7⅞ — 8⅛	8⅛	..	— ¼	5 19 5
£1,279	Do. do. 4½ % Cum. Pref. (Reduced from 5% since 31st Dec., 1905)	£	4½%	4½%	4½%	4½%	5 — 5⅛	5 — 5⅛	..	..	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING JULY, 1910.

The July returns of electrical export business rank amongst the best which we have recorded in our pages.

Although the value of the exports, £436,941 (as compared with £313,944 in the previous month), includes £124,651 worth of telegraphic material, or rather more than usual—due to a heavy export to Japan, yet the balance of general business, £312,290, is the highest so far recorded.

Turning to the imports, which amount to £164,226 in value, these show a drop of some £10,000 as compared with the June figures; the re-exports also show a reduction at £17,555.

Of the individual items, machinery exports, valued at some £170,000 for the month, stand out pre-eminent; cable and telephone exports are well up to, while the telegraphic exports—which include a £90,000 item for Japan—are, of course, well above, the usual level.

The import returns do not present any particular feature of interest, the most prominent section being, as usual, electric lamps which this month are valued at nearly £56,000.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Country receiving exports and importing.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric lamps and parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	438	448	11	100	64	2,383	271	156	...	110	5,434	9,415
Germany	904	27	96	351	441	1,283	117	33	...	...	...	3,252
Netherlands and Java	471	975	50	19	...	1,028	...	20	...	40	824	3,427
Belgium	163	1,150	19	108	898	1,638	24	14	...	542	21	4,577
France and French Indo-China	883	83	220	50	11	1,759	27	1,374	21	...	9	4,437
Portugal	24	54	26	10	14	950	21	...	...	37	...	1,136
Spain and Canary Isles...	118	...	111	47	108	153	234	9	...	167	1,022	1,969
Switzerland, Italy and Austria-Hungary ...	94	...	13	13	1,231	3,335	3,339	20	...	...	...	8,045
Greece, Roumania and Turkey	11	30	52	82	...	222	32	10	...	350	114	903
Channel Isles, Gibraltar and Malta	426	12	31	76	132	1,526	862	119	...	...	41	3,225
U.S.A. and Philippines...	62	...	74	34	116	600	...	...	16	6	38	946
Canada and Newfoundland	76	2,919	255	648	1,326	6,528	300	162	155	1,063	13,824	27,256
British West Indies and British Guiana ...	52	...	233	80	...	172	...	72	...	84	15	708
Mexico, Colombia and Ecuador	20	2,074	...	11	18	3,595	163	4	...	309	870	7,064
Peru, Uruguay and Paraguay	31	...	18	66	59	1,595	...	374	...	182	25	2,350
Chile	67	739	222	553	124	589	31	1,205	...	166	127	3,823
Brazil	219	2,862	195	611	169	7,821	11,395	97	71	4,910	4,495	32,845
Argentine	1,128	9,540	944	1,647	127	8,198	...	337	34	5,551	532	28,038
Egypt	32	366	282	...	14	816	14	73	...	550	185	2,332
British West Africa and St. Helena	51	884	15	16	97	2,360	21	9	...	164	390	4,007
Madeira and Portuguese Africa	...	1,114	70	...	...	801	9	3	...	7	1,053	3,057
Cape of Good Hope	947	2,933	133	522	443	2,525	962	18	25	1,412	174	10,094
Natal	756	9,748	326	557	116	18,905	2,510	14	50	702	230	33,914
Rhodesia, O.R.C. and Transvaal	1,600	262	594	1,308	228	3,182	410	2,116	...	127	...	9,827
British East Africa, Mauritius and Aden ...	61	12	22	108	60	258	...	8	12	...	52	593
China and Siam	645	867	49	694	...	3,618	1,160	32	168	163	74	7,470
Japan	590	1,128	201	19	504	13,802	230	2,811	...	656	89,854	109,795
India	1,046	4,663	1,412	1,071	1,302	11,702	3,185	4,398	160	1,681	896	31,516
Ceylon	103	109	77	104	46	203	66	96	16	83	...	903
Straits Settlements, Federated Malay States and Sarawak	144	1,033	429	117	49	567	282	134	91	135	650	3,631
Hong Kong	296	491	...	348	...	1,821	1,254	58	...	136	126	4,530
West Australia	473	708	69	199	52	2,790	113	129	23	278	1,177	6,011
South Australia	205	246	32	290	4	610	99	...	107	87	141	1,821
Victoria	695	3,159	273	892	121	4,924	302	300	25	1,249	912	12,852
New South Wales	1,265	1,796	1,218	852	32	14,497	2,193	1,228	26	2,483	958	26,548
Queensland	193	473	75	43	...	1,217	...	388	152	490	...	3,031
Tasmania...	77	...	...	7	206	1,558	...	...	...	315	...	2,163
New Zealand	935	3,325	514	764	30	5,156	7,697	145	24	438	388	19,416
Total, £	15,301	54,230	8,361	12,417	8,142	134,687	37,323	15,966	1,176	24,673	124,651	436,927

Additional exports: Liberia, telegraph apparatus, £14.

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Norway, Sweden and Denmark	519	...	...	24	...	492	138	341	...	2,585	4,099
Germany	1,099	15,742	2,437	48,073	585	28,195	...	1,024	6,401	6,577	110,133
Holland	12	364	...	1,107	30	50	320	...	21	...	1,904
Belgium	681	3,863	110	31	139	1,846	...	102	461	5,208	12,441
France	...	122	352	1,452	262	962	...	1,856	3,377	3,280	11,663
Switzerland	172	523	...	75	44	1,817	...	16	97	120	2,864
Italy	...	2,888	...	...	...	...	...	...	...	486	3,374
Austria-Hungary	220	175	...	4,812	...	22	...	240	1,028	280	6,777
United States	1,588	188	779	391	318	6,147	1,247	21	44	141	10,864
Total, £	4,291	23,865	3,678	55,965	1,378	39,531	1,705	3,600	11,429	18,677	164,119

Additional imports: Spain, carbons, £107.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

Various countries, mainly as above	3,307	356	...	3,597	...	4,067	...	254	601	5,373	...

TOTAL EXPORTS: £436,941. TOTAL RE-EXPORTS: £17,555. TOTAL IMPORTS: £164,226.

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

RESTRICTED-HOUR SYSTEM OF POWER SUPPLY.

By P. J. PRINGLE.

We hear on all sides the urgent necessity for electricity undertakings obtaining fresh fields of demand. The metallic-filament lamp, which will ultimately prove our best friend, is meantime prejudicing the position of many undertakings, and the pushing of heating and cooking is advocated as a palliative.

While believing that some good results will be gradually obtained from pushing these demands, I am much surprised that the value of a power demand on the restricted-hour principle is not more appreciated. There are only some half a dozen or so undertakings in the country that have done much in the use of this system, but I am of the opinion that herein lies one of the best opportunities, not, perhaps, to every undertaking, but to the majority of them, for increasing their present demand.

Heating and cooking will help to make up the deficiencies in the output of units due to the metallic-filament lamp, but have those who are advocating these new uses, seriously considered the financial effect of them on the undertaking? The price per unit must be in the neighbourhood of 1d. to 1½d. to induce a demand, and such demands in the majority of cases superimpose themselves on the peak loads. Let those who are pushing such demands work out the load factors and revenue per kw. of demand, when I think it is very questionable whether these figures, in a general way, will prove such loads to be remunerative. Restricted-hour power supply has no element of risk; its rate of profit can be definitely fixed, and all consumers, irrespective of whether they are large or small, contribute to this profit in an equal measure.

There is a feeling abroad that load cannot be obtained on a restricted-hour basis, but I contend that until this system has been put into operation and given a fair chance, its value or otherwise cannot be estimated.

In the case of works requiring power during the ordinary factory hours, it is quite evident that a supply on the restricted-hour system cannot be entertained. This class of demand, however, only represents a certain proportion of the total power demand, and in many towns may represent a comparatively small part.

I propose, therefore, to set out in the following article the advantages and possibilities of such a system of supply, and how it is operated in the undertaking with which I am associated.

Possibilities of the Restricted-Hour System.—The majority of undertakings in this country originally started with a lighting demand almost pure and simple, and although to-day a large business is being done in the sale of motor units, the peak load in most undertakings generally occurs during lighting hours.

Except in exceptional circumstances, the motor demand usually overlaps the lighting peak loads. In the majority of undertakings there is generally a considerable difference between the maximum load during day-light hours and the winter peak loads, and the object of the restricted-hour system is to utilise a safe proportion of these kilowatts for power supply.

Mr. A. M. Taylor has been most emphatic in bringing forward his views on the utilisation of accumulators for reducing the peak loads and capital charges on an undertaking. His principle, which is a perfectly sound one, is that consumers should install accumulators on their premises and purchase a restricted-hour supply from the undertaking at an especially low figure. This supply would deal with their day power demands, and, in addition, charge the accumulators for continuing the supply through the restricted peak load hours. I am confident that it is only a question of time for the value of this proposition to be fully appreciated.

The restricted-hour system of power supply does not go as far as this, but it has the great advantage of being able to deal straight away with many of the every-day conditions of demand. It is obvious that as soon as the available kilowatts mentioned above, have been claimed for the restricted-hour supply, that any further demands for power must then be accepted on the ordinary power system of charges. If this is not done, a day peak load will be formed greater than the winter peak load, and plant and mains with their capital charges would have to be allocated to this extra load, which the cheap restricted-hour unit has no provision for.

It must be perfectly clear to all consumers that an undertaking has only a certain available supply to offer on the restricted-hour demand, and the various applicants must be dealt with in rotation.

The question of fog load requires careful consideration, particularly in those towns which are badly subject to such conditions. Before an undertaking settles the number of kilowatts available for restricted-hour supply, the maximum loads and their time of day require carefully plotting out for the year.

Usually every year, although I am afraid latterly, the metallic-filament lamp has rather upset these calculations, one anticipates an increase in maximum demand from a purely lighting supply. All such increases extend the kilowatts available for dealing with the restricted-hour supply, so that when an undertaking has filled up the margin available, there is, year by year, a possibility of extending the supply.

Class of Consumers who can Accept Restricted-Hour Supply.—As previously mentioned, works which conform with the ordinary factory hours, cannot as a rule accept such a supply. The writer has, however, cases where timber works have altered their hours of working to adapt themselves to the restricted hours, and there is always a possibility of other works being prepared to follow this course.

In many cases where consumers must take a general supply during the restricted hours, there may be a certain portion of this demand which it is customary, or a matter of some convenience, to call for at about peak-load time. It would obviously be of considerable benefit to the undertaking to grant special low prices to such demands, and so attract the consumer to transfer to the restricted-hour system.

There are many classes of demand, however, which can be restricted *in toto*, and it will surprise many people to find how a substantial concession in price induces consumers to go out of their way to adhere to such a system. When criticisms are levelled at the restricted-hour system, the effect of these price concessions is very frequently entirely overlooked.

There are in many towns numerous demands for power by small works, factories, shop-keepers, &c., where they are not bound to make their power demands during or near to peak-hours. This applies to motors for cold stores, refrigerating purposes, timber works, water pumping, hoists, sausage and meat machinery, fans, &c. Contractors doing sawing and wood-working, mortar grinding, and general building work, &c., can often work on the restricted-hour system.

A useful field for this system is the supply of power for building operations. The hours of bricklayers, and workmen incidental to such operations, change according to the hour of darkness during the winter months, and it is quite easy for them to accept the restricted-hour system.

My undertaking is supplying restricted-hour power to five motors, totalling 62 h.p., for two large building operations. These motors are used for mortar-grinding, hoisting, stone cutting, planing and polishing, and are bringing in a useful revenue at the rate of £170 per year. The larger building will run into a three years' demand, the price per unit being $1\frac{5}{8}$d.

Motors for hoisting purposes have notoriously bad load factors, and it is a great advantage to the undertaking to get such loads transferred to the restricted-hour system.

The driving of refrigerating machinery, cold stores, ice making, &c., is another very valuable field for the restricted-hour system. Such loads may, during the summer months, be 24-hour ones, and in such cases it is usually found that during the winter months they reduce down to less than half this, and there is no difficulty in keeping them off the peak hours.

I was interested in reading a description lately of how some of the American stations are utilising ice-making plants for improving their load factor. Extensive ice-making

machinery is installed at the power station, and it is arranged to shut this down during the peak loads, thus filling up the low places in the load curve. The total cost of power to be allocated to such plant can be reckoned at a very low figure, and the power station is thereby enabled to manufacture and sell ice at prices which are impossible to the ordinary manufacturer.

It may be of interest to give some description of how my undertaking has advanced in this direction, the refrigerating plants, however, being on consumers' premises and not part of the power house business.

There is a fair demand in this town (Burton-on-Trent) for power for refrigerating purposes, and I realised some three or four years ago that it would be a very valuable load to obtain. Owing to all refrigerating plants running on a practically constant load for long hours, the prices for electric power must be low to compete at all with gas or steam engines.

To get the best effect on our load factor, and also to save extensions of our plant, I arranged for the whole of the load for refrigerating purposes in this town to be sold on the restricted-hour principle of power supply, that is to say, to be cut off during those hours when it is likely to overlap the lighting peak loads.

We are at present supplying the following single-phase motors, totalling 254·75 H.P., entirely used for refrigerating purposes for different businesses in this town :—

Four brewers.	*Three butchers.*	*One fishmonger.*	*Two cold storages.*
One 45-H.P.	One 15-H.P.	One 5-H.P.	One 15-H.P.
One 45-H.P.	One 7·5 H.P.		One 7-H.P.
One 35-H.P.	One 1·25 H.P.		One 6-H.P.
One 30-H.P.			One 4-H.P.
One 10-H.P.			Two 1·25-H.P.
One 7·5-H.P.			
One 7·5-H.P.			
One 7·5-H.P.			
One 4-H.P.			

The units sold for the above motors (less four totalling 23-H.P., connected later) amount to 276,364 per annum, and this quantity represents 50 per cent. of the total output for motive purposes. As this demand does not increase the maximum load, it will readily be seen what a very valuable effect it has upon the load factor at the station.

For the small consumers the price is 1d. per unit, but the greater proportion of the demand is sold at a price of ¾d. per unit. I would recommend all undertakings to make a strong bid for this class of demand, and get it, if possible, on the restricted-hour principle. It is then quite easy to bring down the price so as to readily compete with either gas or steam power, working under the favourable conditions which generally attach to such a load.

The list below gives the H.P. in motors on restricted supply, and the class of business they are used for :—

Burton-on-Trent Corporation Electricity Department.

List of Motors on Restricted-Hour System.

Work engaged on.	*No. of motors.*	*Total H.P.*
10 Refrigerating users	19	254·75
4 Building contractors	13	118·50
3 Joinery and timber works ...	20	181·0
8 Breweries—machinery consists of mashing machines, screening, pumping, hoisting, &c. ...	26	150·0
3 Water-pumping plants (one being town's supply)...	4	33·0
2 Motor and cycle shops	2	9·0
1 Mineral water works	1	5·0
1 Printing works	1	5·0
4 Other small businesses	4	10·0
Totals	90	766·25

The large proportion of motors that is running on a restricted-hour supply, *e.g.*, 766¼ H.P. out of a total of 955 H.P., or 80 per cent., will, I think, come as a surprise to engineers. While many towns could not hope, owing to the nature of the local demand, to obtain such a condition of things, still these results prove the many possibilities appertaining to such a scheme.

Transferring Existing Consumers on to Restricted-Hour Supply.—When considering the introduction of the system, a careful study should be made of those motors which it would be an advantage to the undertaking to get transferred to the restricted-hour system.

In my undertaking the restricted-hour system was first introduced in the autumn of 1906 (four years ago), and during the month of November I was able to transfer 176 H.P. of motors, utilised by two large timber mills and a building contractor, to the restricted-hour system, and thereby make a useful reduction in the December maximum load. These consumers would, in the ordinary way, have superimposed their demands on our peak, which is generally between 4.30 p.m. and 5 p.m.

This transference obviated an extension of plant in the following year. The concession we were able to offer them in price was the sole inducement for these consumers to transfer to the restricted-hour system, and there is no doubt that many undertakings could work on similar lines.

Price per Unit.—I am aware that many contend that all units sold by a supply undertaking should bear their proper proportion of capital charges, and that it is not right that, because certain units are sold in the nature of a by-product, they should not bear their share of the capital charges.

If an important extension of plant is incurred to deal with a certain demand, then many believe that such demand should only bear the capital charges directly due to such special plant, and if the existing building is utilised, a fair proportion of the charges on same. If, however, a demand arises which calls for no allocation of any plant or mains, then, in accordance with the above reasoning, such a demand would be relieved of any capital charges.

As long as the restricted-hour unit is sold at a figure which will give a fair rate of profit beyond its out-of-pocket cost, its sale is obviously strengthening the financial position of the undertaking, and may thereby directly benefit other classes of consumers. For example, an improvement in the finances may permit of a reduction in price to the lighting and ordinary power consumers.

If the restricted-hour unit is debited with the same proportion of capital charges as the ordinary unit, what is the result? Demands which could be obtained at the lower figure are lost, and the undertaking suffers in consequence. This, of course, reacts on the other classes of consumers. This contention has been most markedly borne out in the undertaking I control. The falling-off in the revenue from lighting has been so serious in the last two years, owing to the introduction of metallic-filament lamps, combined with severe trade depression, that undoubtedly the undertaking would have been on the rates if the new demand obtained from the restricted-hour system had not been in operation. Instead of rate-aid, an average of nearly £1,000 surplus has been obtained for each of the last six years.

The direct cost to an undertaking of the sale of units on the restricted-hour system may be represented by the following :—

Fuel costs, not based upon the averaged fuel costs per unit of the undertaking, but on the cost for the additional units turned out. The improvement in the load factor on engines and boiler plant obviously permits of fuel costs lower than the average for the whole supply. In my undertaking, during certain periods of the year, the additional units have cost ·15d. for fuel.

A proportion of the costs for repairs and maintenance, oil, waste and stores, and wages must be allocated, but these charges can again be much less than the average for the whole undertaking.

A small proportion of management, rents, rates and taxes, together with the capital charges incurred in connecting on the consumer, should also be debited. Many undertakings would find that ·3d. to ·4d. would cover the whole of the above costs.

Our ordinary prices for power supply are on the maximum demand system of 3d. and 1d., giving a price per unit varying down to about 1½d. For large consumers the price is reduced to 1d. flat rate. The prices that the restricted-hour unit is sold at are as follows :—

For a consumption up to 20,000 per annum	...	All units at 1d.
For a consumption exceeding 20,000 up to 40,000 units per annum	...	$\frac{15}{16}$d.
For a consumption exceeding 40,000 per annum up to 65,000 units per annum	...	$\frac{7}{8}$d.
For a consumption exceeding 65,000 per annum up to 100,000 units per annum	...	$\frac{13}{16}$d.
For a consumption exceeding 100,000 per annum	...	$\frac{3}{4}$d.

Larger demands will be subject to further reductions.

It will be seen that the small consumers get a rebate of at least $\frac{1}{3}$d., and in many cases more, and the larger users a rebate varying down to $\frac{1}{4}$d. per unit, by agreeing to restriction in use.

The rate of profit to my undertaking from the restricted-hour supply is, I contend, considerably in excess of that obtained by the average undertaking for their ordinary power supply.

Where it is not found advisable to sell at a lower figure than 1d. per unit for ordinary power supply, the adoption of the restricted-hour system at once permits of the price being reduced to $\frac{3}{4}$d. or even $\frac{1}{2}$d., and thus secures profitable loads which otherwise would be lost.

A municipal undertaking, particularly, is strongly criticised if it does not treat all consumers on a common basis, and an undertaking, therefore, which has only one rate of charge for power supply would find all such difficulties removed by introducing a restricted-hour supply on the above low prices. These prices would open up an entirely new field, and successfully compete with other motive powers running under the most favourable conditions.

Hours of Restriction.—By plotting out curves of the maximum loads and the hours of same for, say, the last two years, and then plotting against these quarter-hourly, half-hourly, and longer if necessary, the loads previous to, and after these, the maximums, a very good idea can be obtained as to when the restricted hours should commence for the various months, and the kilowatts available. Local conditions of demand will, of course, effect this considerably.

In my undertaking the hours of restriction that have been decided upon are as follows :—

October	1st	to October 15th ...	... 5.30 p.m. to 7.30 p.m.
„	16th	„ „ 31st ...	... 5.0 p.m. to 7.30 p.m.
November	1st	„ November 15th ...	... 4.15 p.m. to 7.30 p.m.
„	16th	„ January 15th ...	... 3.45 p.m. to 7.30 p.m.
January	16th	„ „ 31st ...	... 4.30 p.m. to 7.30 p.m.
February	1st	„ February 15th ...	... 5.0 p.m. to 7.30 p.m.
„	16th	„ „ 28th ...	... 5.30 p.m. to 7.30 p.m.
March	1st	„ March 15th	... 6.0 p.m. to 7.30 p.m.
„	16th	„ „ 31st	... 6.30 p.m. to 7.30 p.m.

Wednesday, being early closing, and Saturdays (other than those coming in Christmas week) if specially desired, are allowed to be unrestricted.

(No restrictions from April 1st to September 30th.)

Enforcing Restricted Hours.—It is desirable in a general way to use time switches for this purpose. Personally, however, I find that I can with security rely upon certain customers adhering to the restricted hours without such precautions. In other cases, time-switches have been fitted.

The adoption of time switches would have been more general if a switch which was suitable in every way, were on the market. As motor supply calls for large carrying capacities, and particularly so in alternating-current motors on 2,000-volt supply, time switches must be reasonable in cost. A time switch for moderate capacities should not, if possible, exceed £2 to £3 in cost, with a small increase for the heavy demands. To cover the cost of these, a small rental should be charged the consumer.

To prevent insignificant demands being asked for on the restricted-hour system of supply, it is desirable to require a rental from the time switch or a minimum revenue from the the supply.

(*To be concluded.*)

Milnrow Tramways.—The U.D.C. has received sanction to the order for the extension of the tramway from Firgrove to New Hey, and has written to the Rochdale Corporation asking that the construction be proceeded with. The Rochdale Tramways Committee has referred the application to a sub-committee

REVIEWS.

Alternating Current Motors. By A. S. McAllister. Third edition. London : Hill Publishing Co. 12s. 6d. net.

That a third edition of this work should be so soon required is a proof that it has appealed successfully to a numerous class of readers, and the reasons for this are not far to seek. They may be stated briefly as follows :—

1. The text is *not* of a semi-popular nature, and space, capable of profitable employment, is *not* padded out with photographs.

2. The work is not simply a collection of formulæ, for the author makes a thorough effort to place before the reader the physical nature of everything discussed. He consistently attempts to present a mind picture of the various magnetic phenomena, and is very sparse in his use of mathematics, though, on the other hand, wherever a mathematical analysis is likely to help in the treatment of the subject, it is always given.

3. The work is truly up to date, and is being kept up to date. A few years usually seem to make a treatise on alternating current obsolete, so fast does the subject develop.

4. The treatment is scientific and *exhaustive*, and the reader really feels that he has learned something when he lays the book down.

In dealing with such a complex subject as A.C. motors, bristling with a wealth of detail and involving many obscure magnetic and electrical phenomena, the method of laying it before the reader in a connected and consecutive form becomes of the first importance. Nothing could be so fatal as the want of a well thought-out system, and much of the success of this book must be put down to the solving of this problem. The solution is, indeed, very simple, and consists of first outlining the theory of any given type of motor roughly, and then going over the matter again and putting in detail. By this method side issues are kept in their proper place, and never confused with the main idea.

The chief details in which this edition differs from the last, are that the essential features of the recently-developed "split-pole" variable ratio synchronous converter are discussed in very simple terms ; there has been added a chapter on "synchronous motors," in which all the characteristics of this machine, both as a motor and a "condenser," are fully treated ; and the chapter on "prevention of sparking in single-phase commutator motors," has been expanded to include the recent improvements in commutating-pole motors.

The main divisions of the work are as follows :—(1) Single-phase and polyphase circuits ; (2) outline of induction motor phenomena ; (3) observed performance of induction motor ; (4) induction motors as frequency converters ; (5) the single-phase induction motor ; (6) graphical treatment of induction motor phenomena ; (7) induction motors as asynchronous generators ; (8) transformer features of the induction motor ; (9) magnetic field in induction motors ; (10) synchronous converters ; (11) synchronous motors ; (12) electromagnetic torque ; (13) simplified treatment of single-phase commutator motors ; (14) motors of the repulsion type treated both graphically and algebraically ; (15) motors of the series type ; (16) prevention of sparking in single-phase commutator motors ; (17) the leakage reactance of induction motors.

A few particulars as to the scheme of the work may be noted. As an illustration of the method of treatment referred to above, Chapter XIII deals with the physical phenomena involved in the operation of single-phase commutator motors, without any reference to the mechanical dimensions of the electrical constants ; in Chapters XIV and XV, however, these motors are discussed in detail, and the exact relation between the parts of each machine is treated both algebraically and graphically. With regard to induction motors, Chapter VI shows that, in its effect upon the primary quantities, the secondary circuit may be considered as composed of a constant reactance, and a variable resistance. In developing the graphical diagram of the induction motor, the proof that the current locus is (approximately) a circle, has been based on the relations between the equivalent electric circuits considered as certain inter-

connected resistances and reactances, rather than on the resolution of the magnetic flux into certain components.

The new chapter on the synchronous motor deals with synchronous impedance, the E.M.F. locus, circular-current excitation loci, circular-current load loci, the O-curves and V-curves, over-excitation, the synchronous condenser, synchronous condensers with induction motors, and voltage regulation.

Throughout the work the greatest use has been made of graphical calculation.

Direct and Alternating-Current Testing. By Frederick Bedell, Ph.D., assisted by Clarence A. Pierce, Ph.D. London: Constable & Co., Ltd. 8s. net.

We have here a work, primarily intended for use by students, but of considerable interest and value to those who have left student days behind them, so far as one can ever be said to do so. The engineer whose soul is in his work is always a student, and to such, provided that his interest lies at all in the direction indicated by the title, this book will be acceptable. It is nicely written, and holds the attention, which is more than can be truthfully said of some works dealing with similar subjects which come before us.

In the preface, some doubt is thrown upon the advisability of using prepared blanks and forms for testing, the results obtained being good from a technical, but not so good from a teaching, point of view.

The division of the book is systematic; there are seven chapters, each dealing with a particular branch of the subject. Two experiments are given in every case except that of the transformer, when three are given. The experiments are reasoned out from first principles, and theoretical tuition is also afforded by copious appendices, which are placed directly after the experiment to which they refer, instead of at the end of the book, where nobody but the conscientious reviewer ever turns to them. Every consideration which can possibly occur is discussed. Take, for instance, Chapter VI, which deals with polyphase currents—a subject of topical interest—and let us look at the considerations included. A general study of polyphase currents occupies pages 196 to 199; two-phase measurement takes up pages 199 to 204; three-phase measurement is discussed, including transformer connections, on pages 204 to 211; equivalent single-phase quantities, on pages 211 to 213, bring us to the end of experiment 6A. Then comes Appendix I—discussing vector addition of alternating currents and electromotive forces in a network of conductors, the laws of such addition, the notation to be used, the polygon method and the radial method of representation, and some advice as to the choice of the method to be used—from page 213 to page 216. Appendix II, pages 217 to 221, deals with the triple harmonic in delta and star connection. Appendix III discusses the copper economy of various systems, on the basis of the same voltage from the line wire to the neutral, or between line wires; the continuous current system; and remarks on the choice of a system. This takes up pages 220 and 221. Experiment 6B considers the measurement of power and power factor in polyphase circuits, pages 222 to 237, and the verification of methods of measurement occupies pages 238 and 239. Appendix I, pages 239 and 240, gives a proof, employing the integral calculus, of the methods used. It will be seen from this that although nominally only two experiments are set out, they deal with the subject in a very complete way.

So many interesting matters are put before us, that it would be easily possible to extend a review to great length. There are not many literary faults in the book, but infinitives are often split, and in some cases sentences are not in complete agreement with themselves; for instance, on page 60, paragraph 35, line 2, we have "No-load runs . . . gives," and again, "Instead of speeds, armature voltage is commonly plotted as abscissae." This sentence would be improved by substituting "speed" for "speeds," or "voltages are," for "voltage is." On page 77, in fig. 1, "field amperes" are plotted against "terminal voltage"; in this case the terms "current" and "pressure" would be better. The word "auxillary" is usually spelt differently.

Sometimes we find unusual phraseology, as in the case of "optimistic" and "pessimistic" characteristics. We have often encountered human beings possessed of such things, but the use of the terms in reference to electrical generators is new to us. The mental picture of the doleful alternator, whose burden is greater than it can bear, is too pathetic for words. The very learned and detailed discussion of the predetermination of alternator characteristics, which cannot, after all, be done with great accuracy, becomes almost metaphysical.

The question of inductance and capacity in an alternating current circuit is treated in a way which should appeal to power engineers. It is of considerable, though frequently under-estimated importance, and notions are often hazy on the subject.

Polyphase transformations, two to three-phase, are considered with care. In the considerations of the transformer we very soon encounter mention of the extremely useful standardisation rules of the American Institution of Electrical Engineers. While too much standardisation is undesirable from a teaching standpoint, it will be admitted that for testing machines for commercial use, standard methods might be introduced with great advantage to both manufacturers and users. The English Institution of Electrical Engineers seems to have an aversion to formulating any such rules, for this or other things. Papers are read before the members dealing with the rating and testing of motors, and we frequently hear the absence of definite guidance lamented, and perhaps in time something may be done in the direction indicated. The interests of the profession are the total of the interests of the component parts, and the generalising attitude adopted is not helpful. This point is, as we have said, emphatically brought out by the frequent mention of the American rules.

The expressions "it is obvious" and "it is easy to see" occur rather too often for our liking. We believe it was Mr. Swinburne who said that these expressions might be rendered "I do not know how to prove." Of course, this is not the case here, but we think that in a book intended, as this one is, for the instruction of students, the use of such phrases should not be encouraged.

It is useful to know that by using a slide-rule as a scale, it is possible to use ordinary sectional paper instead of logarithmic paper, which is more expensive and of more restricted use.

We have said enough to indicate that the book is one which should attract the interest of a wide circle in the profession. Its completeness, its literary quality, its clear reasoning, and the deep knowledge of the subject which is displayed throughout, combine to make it useful not only as a course of study for students, but as a work of reference for all.

Foreign and Colonial Patent Laws. By Wallace Cranston Fairweather, M.A., Chartered Patent Agent, &c. London: Constable & Co. Price 10s. 6d. net.

This work, according to the preface, is the result of an attempt on the part of the author to provide a summary of the law and practice in obtaining and maintaining patents in all countries. The first part of the work treats of the laws of British Colonies and dependencies; the second relates to the laws of foreign countries. While the laws in force in the British possessions are fairly uniform and approximate closely to the patent law of the United Kingdom, foreign laws vary within wider limits. As the author points out, they may be grouped in three main classes, according as they are most nearly akin to the patent law of the United States, of France, or of Germany. Having regard to these facts, the author has adopted the wise plan of separate treatment. In the course of a few pages he contrives to summarise the laws of each colony and country. The greater part of his space is devoted to consideration of the questions which arise in the course of the proceedings leading to the grant of patents, and which determine the validity of patents when granted. These are of more immediate importance to the average patentee than details of the practice in infringement actions, in which less than 1 per cent. of the patents granted are involved.

The arrangement of the subject matter in short articles dealing with the laws of each country has much to commend it; but it is a little disappointing to find that the author

prints no sub-headings which would guide the practitioner to any particular point. For instance, 17 pages are devoted to the patent laws of the United States of America, but there is nothing to indicate where any particular point is dealt with ; the whole article must be examined. The index, however, affords some clue to the sub-division of the articles.

Under the heading Afghanistan we find the following : "There is no patent law in this country, and, at present, no prospect of the introduction of a patent law." This resembles the famous chapter concerning snakes in Iceland. But this is no unkind criticism, for it is often important to know whether any protection can be obtained at all in any particular State.

It is interesting to notice that while there is no patent law in China, their neighbours the Japanese have recently passed a law (No. 23 of April 2nd, 1909), whereby the inventions may be protected. The subject of a valid patent must be a new industrial invention not being within one of the following categories :—(1) Inventions of articles of food, or drink or relish ; (2) inventions of medicines or of processes or compounding them ; (3) inventions the use of which is contrary to public order or morality, or injurious to health ; (4) inventions which have been publicly used in the Empire, or publicly known there, or described in printed matter circulated in the Empire before the date of application for a patent. There is much else descriptive of the patent law of Japan.

We can heartily commend this work to those who desire to obtain protection for their inventions to different parts of the world.

SOME LEGAL QUESTIONS RELATING TO ELECTRICAL FITTINGS.

[BY OUR LEGAL CONTRIBUTOR.]

The Electric Lighting Act, 1909—which as has already been pointed out in these columns—came into force on April 1st, 1910, has effected many changes in the law. Some of these have already been dealt with in these pages ; it is now proposed to draw attention to such changes of the law as affect electrical fittings.

It may be convenient, in the first place, to consider some sections of the older electric lighting Acts in their bearing on electric fittings. Thus, Sec. 24 of the Electric Lighting Act, 1882, provides that any officer appointed by the undertakers may at all reasonable times enter any premises to which electricity is, or has been, supplied by the undertakers, in order to inspect the electric lines, meters, accumulators, fittings, works, and apparatus, for the supply of electricity belonging to the undertakers, and for the purpose of ascertaining the quantity of electricity consumed or supplied, or whereby the undertakers are authorised to take away and cut off the supply of electricity from any premises, for the purpose of removing any electric lines, accumulators, fittings, works, or apparatus belonging to the undertakers, repairing all damage caused by such entry, inspection, or removal. The powers conferred by this section must not, however, be arbitrarily exercised. Due notice of an intended visit should be given, for it was decided in Brompton, &c., Electricity Supply Co. *v.* Shadforth (Electrical Review, July 24th, 1903) that where a consumer refused to allow inspectors to come into her house unless she received previous notice of their visit, an injunction ought not to be granted to restrain her.

Electric fittings are also protected from distress for rent. Thus by Sec. 25 of the Electric Lighting Act, 1882, where any electric lines, meters, accumulators, fittings, works, or apparatus belonging to the undertakers (*i.e.*, the local authority or company supplying electricity) are placed upon any premises for the purpose of supplying electricity, they shall not be subject to distress, or to the landlord's remedy for rent of the premises where the same may be, nor shall they be taken in execution under any process of a court of law or equity, or any proceedings in bankruptcy, against the person in whose possession the same may be. In the ordinary way, they might be seized by a landlord whose rent was in arrear. This affords considerable protection to the undertakers. Very often, when a tenant does a moonlight flit, the only articles of *vertu* left on the premises are the electrical fittings, which the landlord would be glad to sell in order to satisfy some part of his claim for rent outstanding.

But what are "fittings" within the meaning of the section ? Wires, and pipes through which wires are laid naturally come under this heading, but there are other things not so easy to classify. It was decided under Sec. 14 of the Gas Works Clauses Act, 1871, which is similar to the above, that a gas stove let for hire is a "fitting for the gas" within the meaning of that section, and is therefore not subject to distress for rent (see Gas Light and Coke Co. *v.* Hardy, 1886, 17 Q.B.D. 619). It would seem to follow from this that electric stoves, kettles, motors, fans and electric irons, if hired out by the local authority to the consumer, would not be subject to distress by the landlord.

The new Electric Lighting Act of 1909 gives a further protection to electric fittings. It is there provided by Sec. 16 that "all electric lines, fittings, apparatus and appliances let by any undertakers on hire or belonging to any undertakers, but being in or upon premises of which the undertakers are not in possession, shall, whether they be or be not fixed or fastened to any part of any premises in or upon which they may be situate, or to the soil under any such premises, at all times continue to be the property of, and be removable by, the undertakers, and Secs. 24 and 25 of the Act of 1882 shall extend and apply to all such electric lines, fittings, apparatus and appliances : Provided that such electric lines, fittings, apparatus or appliances have upon them respectively a distinguishing metal plate affixed to a conspicuous part thereof, or a distinguishing brand or other mark conspicuously impressed or made thereon, sufficiently indicating the undertakers as the actual owners thereof. For the purposes of this section, electric fittings, &c., disposed of on the terms of payment by instalments are deemed to be electric fittings, &c., let on hire by the undertakers. This section does not affect the amount of the assessment for rating of any premises upon which any electric lines, fittings, apparatus or appliances are or shall be fixed.

A nice question may sometimes arise some day as to whether electric fittings let on hire by the supply authority vest in the trustee in bankruptcy of the consumer. The law of bankruptcy provides that goods which are in the order and disposition of the bankrupt, with the consent of the true owner at the date of his bankruptcy, shall vest in the trustee for the benefit of creditors. And this is right ; for credit is naturally given to a man upon the strength of the goods which he has on his premises. But where it is well known that certain classes of goods are customarily lent on hire, the presumption that they belong to the bankrupt does not arise. For instance, the custom of hotel-keepers to hire furniture is so well known that such furniture does not vest in the trustee in bankruptcy of the hotel proprietor.

Questions arise from time to time as to the power of local authorities supplying electricity to deal in fittings. It is common to find in the Acts of local authorities a special clause enabling them to sell, let, hire, but not to manufacture, lamps, meters, electric fittings, &c. The terms of such clauses vary somewhat. In the Nottingham Corporation Act, 1899, Sec. 4, the power conferred is to provide and let, &c., but not manufacture, "lamps, meters, electric lines, fittings, apparatus, and things for lighting and motor power, and for all other purposes for which electric energy can or may be used, or otherwise necessary or proper for the supply, distribution, consumption or use of electrical energy." The Manchester Corporation (General Powers) Act, 1898, after the usual wide powers, contains these words : "Electrical motors and apparatus for the use of electricity for motive power and other purposes."

The Halifax Corporation Act, 1898, is even wider in its terms. It authorises the Corporation to "purchase, hire, sell, let on hire, or otherwise deal with dynamos, electric motors, accumulators, meters, burners, arc and other lamps, fittings, wires, plant, engines, conductors, machinery, apparatus and appliances for and in relation to the production, supply, distribution or utilisation of electricity or required or used for or in connection with their electrical works and undertaking."

THE JAPANESE ELECTRICAL INDUSTRY.*

By M. KAWARA.

A collection of electrical statistics compiled by the Japanese Government, and published in the *Electrician's Friend*, of Tokyo, contains some interesting figures and shows the general trend of the industry in Japan more clearly than anything yet published. The following tables refer to the year 1908 :—

Generators listed under the head "ordered" were mostly in plants in course of construction. It is to be noted that the new plants are adopting larger generators, and that the size of stations is growing more than their number, as the use of higher voltages becomes more and more common. For instance, the average rating

TABLE I.—Japanese Electrical Generating Statistics for 1908.

—	Generators. Operating.	Generators. Ordered.	kw. Rating. Operating.	kw. Rating. Ordered.
Water	274	81	61,376	65,237
Steam	857	105	94,202	27,329
Gas and oil ...	69	10	757	219
Electricity	18	3	243	300
Total	1,218	199	156,578	93,085

of hydraulically-driven generators in operation is 220 kw., while the rating of those under construction is 800 kw. The average ratings for steam-driven generators are 110 kw. and 260 kw. respectively.

Classified according to the voltage adopted the following figures obtain :—

TABLE II.—Voltage Adopted in Transmission System.

Limiting voltage.	Generators. Operating.	Generators. Ordered.	kw. Rating. Operating.	kw. Rating. Ordered.	Total. No.	Total. Rating.
500	800	64	30,596	7,258	864	37,854
3,000	386	115	93,502	70,127	501	163,629
—	32	20	32,480	15,700	52	48,180
Total...	1,218	199	156,578	93,085	1,417	249,663

Table II also confirms what has been said regarding the size and voltage of generating stations.

Classified with reference to direct and alternating current the results are as given in Table III.

Here again it will be noted that the majority of the stations under construction adopted alternating current, which means higher voltage and longer transmission lines.

TABLE III.—Type of Generators.

Kind of machine.	Generators. Operating.	Generators. Ordered.	kw. Rating. Operating.	kw. Rating. Ordered.	Total. No.	Total. Rating.
D.C. ...	791	64	29,645	10,258	855	39,903
A.C. ...	427	135	126,933	82,827	562	209,760

The following table shows the sizes of generators, including both those already in operation and those in process of erection :—

TABLE IV.—Generators Arranged According to Rating.

Limiting size. kw.	Generators. Operating.	Generators. Ordered.	kw. Rating. Operating.	kw. Rating. Ordered.	Total. No.	Total. Rating.
10	186	9	1,017	55	195	1,072
50	481	27	11,900	806	508	12,706
100	195	18	12,521	1,145	213	13,666
500	274	80	52,595	16,989	354	69,584
1,000	46	35	27,445	23,705	81	51,150
—	36	20	51,100	50,385	66	101,485
Total ...	1,218	199	156,578	93,085	1,417	249,663

The frequency of the alternating-current generators varies from 50 cycles to 133 cycles. The predominating frequency is 60, due largely, perhaps, to the fact that the majority of the generators are of American manufacture, as shown in Table VI.

TABLE V.—Generator Arranged According to Frequency.

Cycles.	Generators. Operating.	Generators. Ordered.	kw. Rating. Operating.	kw. Rating. Ordered.	Total. No.	Total. Rating.
50	71	28	44,811	27,690	99	72,501
60	275	85	64,485	49,547	360	114,032
100	15	1	2,041	30	16	2,071
125	27	2	2,191	120	29	2,311
133	9	—	600	—	9	600
Others	30	19	12,805	5,440	49	18,245
Total ...	427	135	126,933	82,827	562	209,760

The high-frequency machines are old, and without doubt will soon be replaced by standard low-frequency generators. In recent projects 25 cycles has been proposed, and it is likely that this frequency will be adopted.

Of 787 generators rated above 50 kw., and now in operation, 171 machines, with a total rating of 15,605 kw., are of domestic make ; 577 machines, with an aggregate rating of 132,251 kw., are imported, and the remaining 20, with a combined rating of 695 kw., are not clear as to their origin. The manufacturers who supplied these generators are given in Table VI.

TABLE VI.—Geographic Distribution of Manufacturers.

	Generators.	*KW. rating.*
United States	434	87,369
General Electric Co.	277	68,455
Westinghouse Co.	89	13,736
Stanley	7	640
Warren	7	345
Others	54	4,193
Germany	107	36,435
Siemens & Schuckert Co.	85	32,970
Allgemeine Elektricitäts-Gesellschaft	21	3,450
Others	1	15
England	45	7,211
Bruce Peebles	5	2,475
Mather & Platt	15	525
Others	25	4,211
Switzerland	5	955
Brown, Boveri	3	895
Others	2	60
Belgium	—	—
International Electric Co.	6	281
Japan	171	15,605
Shibaura Works	122	12,524
Miyoshi Works	19	692
Ishikawa Shima Shipyard	9	1,085
Osaka Electric Light Co.	8	373
Meidensha	5	312
Mitsubishi Shipyard	3	520
Others	5	99

Although there are a number of home manufacturers, a great majority of generators are of foreign make, especially the larger units. The development of electrical industry is so fast that the home manufacturers cannot keep pace with it. Table VII brings out this point more clearly.

TABLE VII.—Imports of Electrical Goods.

	1906.	1907.	1908.
Insulated wires	$103,821	$1,231,356	$933,565
Electrical machinery ...	952,043	1,271,469	1,860,588
Lamps, sockets, &c. ...	118,197	63,395	611,338
Telephones	57,372	52,763	56,531
Electric traction machinery	152,876	279,266	231,018
Steam turbines	64,906	502,984	375,207
Engines	441,699	675,084	883,333
Boilers	619,181	732,115	665,859
Gas and oil engines ...	109,046	274,739	283,313
Total	$2,619,141	$5,083,171	$5,900,752

The electrical machinery, which appears in the second row in the above table, was supplied from the following countries, as shown in Table VIII :—

TABLE VIII.—Value of Electrical Imports.

	1906.	1907.	1908.
United States...	$564,656	$763,437	$1,169,762
England	221,267	353,757	333,518
Germany	99,125	146,741	338,337
Other countries	66,995	7,534	18,971
Total	$952,043	$1,271,469	$1,860,588

From the last two tables it is seen that the home manufacturers are unable to keep pace with the fast growing demand, and consequently the importation of electrical goods is increasing at about an average rate of 50 per cent. per year even during times of financial distress, which have been felt over Japan as keenly as in the United States. Among the exporters to Japan, the United States obtains the bulk of the trade, about 60 per cent. of the total. Germany seems to be improving rapidly, while England holds its own.

* *Electrical World*, New York.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

ROUMANIA.—(*Concluded.*)

	Lei per 100 kg.
Voltaic arc lamps and their mechanism	75
N.B.—Fittings—*e.g.*, the globes, lamp-posts, &c.—follow the treatment of the material of which they are composed.	
Electric apparatus for telegraphs, telephones, transmission of power, lighting, bells, interruptors, batteries for medical and chemical purposes, and all small articles connected with the use of electricity	80
Cables for the transmission of electric currents, and insulated wire for electrical purposes :	
With covering or casing of sheet iron, iron wire or iron bands	12
Without metallic covering, but insulated with paper, asbestos, or other materials not specially mentioned	20
Insulated with india-rubber or gutta-percha	30
Insulated with textile thread other than silk, even combined with other material	50
Insulated with silk thread	100
Vehicles running on rails :	
Goods wagons, covered or not, and tenders	7
Carriages for passengers, not upholstered	9
" " " upholstered	15
Tramway carriages	40

NEW PATENTS APPLIED FOR, 1910.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

18,622. "Improvements in the manufacture of conduit fittings for electrical and like purposes." A. Brampton and C. W. Thorneycroft. August 8th.

18,624. "Apparatus for driving disk or cylinder talking machines by the electric current from any public installation or main for lighting or power, or by manually wound spring power." N. D. Ezekiel. August 8th.

18,631. "Improvements relating to the propulsion of vehicles by combination of prime mover and electrical storage." F. W. Lanchester. August 8th.

18,656. "Flexible cord attachment for electric lampholders." C. A. M. Renton. August 8th.

18,678. "Improved system of control and apparatus for indicating electric calls." L. Viette. (Date applied for under Sec. 91 of the Act, October 19th, 1909, being date of application in France.) August 8th. (Complete.)

18,695. "Improvements in electro-plating apparatus." T. R. Canning. August 8th.

18,697. "Improvements in electric signs." A. Gallanzi. August 8th.

18,733. "Improvements in current collectors for electrically propelled vehicles." R. H. Wilkinson and A. R. Fearnley. August 9th.

18,738. "Improved holder for electric incandescent lamps." G. Weissmann. (Date applied for under Sec. 91 of the Act, August 10th, 1909, being date of application in France.) August 9th. (Complete.)

18,786. "Improvements in or relating to apparatus for measuring and indicating the ratio of electrical forces and turning moments." C. Tobias August 9th. (Complete.)

18,794. "Improvements in or relating to ignition apparatus." A. H. Smith and Muirhead & Co., Ltd. August 9th.

18,801. "Electrical incandescent lampholder attachment for the protection of flexible cable against fire and lamp filaments against vibratory motion." P. P. Wheelwright and E. Moxon. August 10th.

18,821. "Improved sheath for electric lamps." J. Gill. August 10th.

18,837. "Improvements in stator windings for single-phase electric induction motors." Siemens Bros. Dynamo Works, Ltd. (Siemens-Schuckertwerke G.m.b.H., Germany.) August 10th. (Complete.)

18,848. "Improvements in starting arrangements for single-phase alternating current series motors." Siemens Bros. Dynamo Works, Ltd. (Siemens-Schuckertwerke G.m.b.H., Germany.) (Complete.)

18,850. "Improvements in driving connection for electrically-propelled vehicles." W. Cooper. (Date applied for under Sec. 91 of the Act, September 10th, 1909, being date of application in United States.) August 10th. (Complete.)

18,867. "Improvements in and relating to devices for securing wires or conductors in place." British Thomson-Houston Co., Ltd. (Allgemeine Elektricitäts Ges., Germany.) August 10th.

18,868. "Improvements in and relating to signalling systems." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) August 10th.

18,869. "Improvements in and relating to switches for working in connection with dynamomotors, accumulators and the like." S. L. Price. August 10th.

18,916. "Improvements in fittings for use in connection with electric incandescent lamps." A. H. Midgley and C. A. Vandervell. August 11th. (Complete.)

18,935. "Improvements in or relating to electric telegraphy." S. G. Brown. August 11th.

18,946. "Improvements in or relating to ignition mechanism." A. J. Boult. (J. Ruzicka, Germany.) August 11th. (Complete.)

18,948. "Improvements in and relating to electric signalling for telegraph apparatus for use on vehicles and for other purposes." R. B. North and W. G. Ward. August 11th.

18,965. "Improvements in coin chutes for coin-freed telephone boxes and the like." F. W. W. Breakell. August 12th.

18,969. "Improvements in or relating to the electrolytic reduction of organic bodies." H. Higgins. (E. Higgins, United States.) August 12th.

18,972. "New or improved method of and appliances for greater safety in istribution for electric light and power circuits." A. Barry. August 12th.

18,999. "Improvements in and relating to holders for shades and the like for electric incandescent lamps." E. E. L. Pattison. August 12th.

19,019. "Improvements in or relating to rheostats or heaters or like devices." H. W. Leonard. August 12th. (Complete.)

19,030. "Improvements in and relating to filaments and the like for electric incandescent lamps." W. C. Arsem. August 12th. (Date applied for under Sec. 91 of the Act, August 18th, 1909, being date of application in United States.) (Complete.)

19,031. "Improvements in and relating to signalling systems." British Thomson-Houston Co. Ltd. (General Electric Co., United States.) (Application for Patent of Addition to No. 18,868, 1910.) August 12th.

19,033. "Improvements in and relating to incandescent electric lamps or like holders." H. O. Beige. (Date applied for under Sec. 91 of the Act, August 12th, 1909, being date of application in Germany.) August 12th. (Complete.)

19,043. "Apparatus for driving disk or cylinder talking-machines by the electric current from any public installation or main for lighting or power." N. D. Ezekiel. August 13th.

19,044. "Improvements in or connected with electrically-driven clocks." P. A. Bentley. August 13th.

19,071. "Improvements in electric switches." G. A. G. Davies, H. W. Kent & D. Kent and Stewart, Ltd. August 13th. (Complete.)

19,076. "Improvements relating to recording mechanism of integrating electricity meters and other instruments." W. H. Johnson and A. M. Billington. August 13th.

19,077. "Improvements in and relating to the manufacture of metallic-filament incandescent lamps." Siemens & Halske Akt.-Ges. (Date applied for under Sec. 91 of the Act, June 9th, 1910, being date of application in Germany.) August 13th. (Complete.)

19,093. "Improvements in electrical measuring instruments." G. G. M. Hardingham. (Hartmann & Braun, Akt.-Ges., Germany.) August 13th. (Complete.)

19,095. "Improvements relating to the manufacture of tungsten filaments." A.E.G. Union Elektricitats Ges. (Date applied for under Sec. 91 of the Act, August 14th, 1909, being date of application in Austria.) August 13th. (Complete.)

19,097. "Improvements in or relating to safety lamps." A. J. Boult. (D. C. J. Enzlin, Transvaal.) August 13th.

19,100. "Improvements in electric heating apparatus for baths, washi n machines and the like." H. Lafquist. August 13th. (Complete.)

19,102. "Improved transmitter for transmitting telegrams composed in perforations on a band by the Baudot system." J. Carpentier. (Date applied for under Sec. 91 of the Act, October 29th, 1909, being date of application in France.) August 13th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1909.

Electrodes of Secondary Batteries. H. Garde and A. J. Adams. 9,066. April 16th.

Methods of Charging and Discharging Electric Accumulators or Secondary Batteries. A. M. Taylor. 14,212. June 17th. (Cognate application, No. 16,522 of 1909.)

Combined Massaging and Magneto-Electric Machine. F. Burks. 16,405. July 14th.

Electric Measuring Instrument chiefly designed for use in Indicating the Speed of Vehicles. L. Rennie. 16,621. July 16th.

Electric Distribution Systems. Dalziel's Constant Voltage Patents, Ltd., and J. Dalziel. 16,645. July 15th.

Protective Devices for Electrical Transmission and Distribution Systems. British Thomson-Houston Co. and A. J. Wedmore. 17,051. July 24th.

Small Electric Transformers. A. J. Boult. (Deutsche Elektro-Sparlicht Ges.) 17,043. July 24th.

Electric Traction Systems. E. G. Pink. 18,459. August 11th.

Electric Joints. C. J. Beaver and E. A. Claremont. 20,106. September 2nd.

Shade-Holders and the like for Incandescent Electric Lights. C. Arnold. 20,666. September 10th.

Electric Fire-Alarm apparatus and the like. R. Knight. 22,378. October 13th. (Cognate application, No. 5,641 of 1910.)

Telegraph Transmitting and Receiving Apparatus. A. W. Lake. (Electric Press Buiietin Co.) 23,328. October 12th.

Driving and Operation of Electric Frequency Transformers having Commutators. Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke Ges.) 24,269. October 22nd.

1910.

Electric Light Bracket for Hospital Operation Theatres and elsewhere. H. A. Down and H. V. Down. 499. January 7th.

Telephone Apparatus. Siemens Bros. & Co. and A. Riber. 467. January 7th.

Systems for Electrically Operated Submarine Mines. Elektriska Aktiebolaget A.E.G. 1,206. January 17th. (Date applied for under International Convention, January 18th, 1909.)

Electro-Deposition of Metals. J. A. Corey. 2,002. January 26th.

Electrolytic Cells. J. R. Croker. 2,032. January 26th.

Means for Electrically Controlling Valves. F. Lux. 3,697. February 15th. (Date applied for under International Convention, February 15th, 1909.)

Manufacture of Alkaline Accumulator Electrodes for Preventing the Dropping of Active Material therefrom. L. Marseille and P. Godin. 3,733. February 15th. (Date applied for under International Convention, March 8th, 1909. Application for Patent of Addition to No. 15,373 of 1909.)

Stepped Ladders for Electric Lamp-Posts, Signal-Posts, Fire-Escapes and the like. J. Weir and J. Reid. 4,018. February 18th.

Control of Electrically Operated Switches. H. E. White and E. B. Carichoff. 4,697. February 24th. (Date applied for under International Convention, February 27th, 1909.)

Supports for the Filaments of Incandescent Electric Lamps. F. Salzer. 6,658. March 16th. (Date applied for under International Convention, March 15th, 1909.)

Electric Fire-Alarm. P. Kukiolka. 9,644. April 20th.

Multiple Fusible Cut-Out for Electrical Circuits. A. E. Partington. 10,961. May 3rd.

Wireless Signalling. R. A. Fessenden. 11,155. May 5th. (Date applied for under International Convention, January 29th, 1910.)

Portable Electric Lamps. F. R. Lange. 13,828. June 7th. (Date applied for under International Convention, February 28th, 1910.)